

Low-Volume  
High-Risk Surgical Procedures

# Surgical Volume and Its Relationship to Patient Safety and Quality of Care

Second Report



May 20, 2019



A REPORT BY THE DEFENSE HEALTH BOARD

INSIDE FRONT



DEFENSE  
HEALTH  
BOARD

**OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE  
HEALTH AFFAIRS**  
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**MEMORANDUM FOR PRINCIPAL DEPUTY ASSISTANT SECRETARY OF DEFENSE  
FOR HEALTH AFFAIRS**

**SUBJECT: Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship  
To Patient Safety and Quality of Care: Second Report**

The Defense Health Board (DHB) is pleased to submit its report summarizing the findings and recommendations from its independent review of Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care: Second Report.

On March 28, 2018, the Acting Assistant Secretary of Defense for Health Affairs (ASD(HA)) requested that the DHB provide recommendations to improve policies for managing facility surgical capabilities and surgeon proficiency. Specifically, the Acting ASD(HA) requested the DHB address and develop findings and recommendations on the policies and practices in place to:

- Determine where high-risk surgical procedures should be performed.
- Optimize the safety and quality of surgical care provided.
- Enhance patient transparency related to surgical volumes and outcomes, and
- Evaluate the contribution of high-risk surgical procedures to medical readiness.

The first report of the tasking, published in November 2018, examined surgical quality and patient safety within direct care (at military medical treatment facilities). For this secondary effort, the DHB Trauma and Injury Subcommittee was tasked to:

- Review the array of low-volume high-risk surgical procedures performed on Military Health System (MHS) beneficiaries in the Purchased Care system (TRICARE).
- Evaluate potential for the MHS to sign on to the “Surgical Volume Pledge” agreed to by Dartmouth-Hitchcock Medical Center, Johns Hopkins Medicine, and the University of Michigan.

The Subcommittee conducted literature reviews on key topics; received briefings from subject matter experts from within the MHS and from the civilian sector; analyzed and interpreted volume, errors, and outcomes data; and reviewed current policies and practices related to patient safety and quality of care, including within MHS, the Veterans Health Administration (VHA), and civilian healthcare systems. The Subcommittee presented to the DHB on May 20, 2019, and following public deliberation of the findings and recommendations, the attached report was approved and finalized.

On behalf of the Board, I appreciate the opportunity to provide the Department with this independent review and hope that it provides useful information to promote and improve patient safety and quality of care across the MHS.

A handwritten signature in black ink, appearing to read "R. B. Myers". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Gen (Ret.) Richard B. Myers  
First Vice President, Defense Health Board

Attachment:  
As stated



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**THE ASSISTANT SECRETARY OF DEFENSE**

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MAR 28 2018

**HEALTH AFFAIRS**

**MEMORANDUM FOR PRESIDENT, DEFENSE HEALTH BOARD**

**SUBJECT:** Request for Defense Health Board Review of “Low-Volume High-Risk Surgical Procedures”

Pursuant to the attached Terms of Reference (TOR) on “Low-Volume High-Risk Surgical Procedures,” I request that the Defense Health Board (DHB) provide recommendations to the Department of Defense in order to improve policies for managing facility surgical capabilities and surgeon proficiency. Specifically, I request the DHB address and develop findings and recommendations on the policies and practices in place to:

- Determine where high-risk surgical procedures should be performed,
- Optimize the safety and quality of surgical care provided,
- Enhance patient transparency related to surgical volumes and outcomes, and
- Evaluate the contribution of high-risk surgical procedures to medical readiness.

The TOR for this review provides a detailed description and scope for this tasking. The point of contact for this action is Captain Juliann Althoff who can be reached at (703) 275-6060, or juliann.m.althoff.mil@mail.mil. Thank you for your continued support and commitment to optimizing the health and force-readiness of the military.

Tom McCaffery  
Acting

Attachment:  
As stated



## **ABSTRACT: LOW-VOLUME HIGH-RISK SURGICAL PROCEDURES: SURGICAL VOLUME AND ITS RELATIONSHIP TO PATIENT SAFETY AND QUALITY OF CARE: SECOND REPORT**

In 2018, a series of U.S. News & World Report articles<sup>1-3</sup> reported on surgical quality and volume within the Military Health System (MHS). In response to these articles, on March 28, 2018, the Acting Assistant Secretary of Defense for Health Affairs requested the Board conduct a review of “low-volume high-risk” surgical procedures in the MHS through two sequential six-month assessments (see Appendix F). The first report of the tasking, published in November 2018, examined surgical quality and patient safety within direct care (at military medical treatment facilities [MTFs]).<sup>4</sup> This second report of the tasking (see Appendix F) addresses surgical quality and patient safety within the purchased care network (TRICARE) and the Surgical Volume Pledge. Some information in this report appeared in the first report of the tasking (Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*)<sup>4</sup> and is included in this report for context.

The MHS is one of the largest and most complex health care organizations in the world: It provides comprehensive health care to 9.5 million active duty personnel, their families, and retirees, in environments that are domestic, global, and austere/hostile, and through three vehicles—direct care (MTFs), purchased care (TRICARE), and deployment care.<sup>5-7</sup> The MHS must meet multiple clinical missions. The MHS ensures that Service members are medically ready to deploy and that the medical force is able to provide complex care in combat zones.<sup>7</sup> At the same time, the MHS provides quality health care for military members, families, and other beneficiaries in the U.S. and overseas.<sup>6,7</sup> Further, the MHS educates and trains health care professionals to sustain the medical force and conducts essential research to keep the fighting force healthy.<sup>6</sup>

Efforts to improve surgical outcomes are not exclusive to the military and have been ongoing in the civilian health care sector for decades. Historically, the literature has observed an association between better surgical outcomes for specific complex operations and performance of higher volumes of certain complex operations by hospitals and surgeons.<sup>8-14</sup> However, across studies, there are significant methodological limitations, including weaknesses in statistics, arbitrary cut-off points (volume thresholds), exclusion of total surgeon and surgical team experience, and failure to adjust for the patient’s level of risk.<sup>15-21</sup> The critical distinction between association and causation must be made when interpreting assertions.

The Board undertook a thorough review of the volume-outcome association and determined that volume alone is not an appropriate measure of quality and outcomes across the direct and purchased care networks. In addition, volume should not be a defining requirement for provider privileging. The Board recommended that the MHS not join the Surgical Volume Pledge; rather, the MHS should work to develop a system-wide quality and patient safety program focused on risk-adjusted, benchmarked outcomes and unified across direct care, purchased care, and deployment care. Program development should include evaluation and implementation of surgical quality verification efforts, in keeping with improved patient outcomes from professional society verification of standards in trauma, cancer, and bariatric surgery centers.



The program must use standard metrics and drive a continuously learning health care system for ongoing improvement in patient safety and quality. Staffing and resources must be at least equivalent to leading civilian health systems and managed care plans.

The Department of Defense (DoD) has a responsibility to ensure medical readiness for global deployments and combat casualty care. It follows that the DoD must: (1) continue to support the Knowledge, Skills, and Abilities (KSA) program with resources for expansion and tracking of outcomes that demonstrate medical readiness; (2) expand civilian and Department of Veterans Affairs (VA) partnerships that sustain surgical readiness through enhanced clinical experience; and (3) promote consistent standards in all partnership agreements for individual and team training.



## **EXECUTIVE SUMMARY: LOW-VOLUME HIGH-RISK SURGICAL PROCEDURES: SURGICAL VOLUME AND ITS RELATIONSHIP TO PATIENT SAFETY AND QUALITY OF CARE: SECOND REPORT**

“The Military Health System (MHS) is a federated system of uniformed, civilian and contract personnel and additional civilian partners at all levels of the Department of Defense (DoD).”<sup>22</sup> The Defense Health Agency (DHA) is the executive agent for the MHS: It acts as a Combat Support Agency, directing joint shared services across the Army, Navy/Marine Corps, and Air Force medical services to sustain a medically ready force and ready medical force to Combatant Commands in both peacetime and wartime.<sup>6,23</sup> At the same time, the DHA acts as a health agency responsible for the care of a very diverse population of young healthy people, retirees, and families at military medical treatment facilities (MTFs) and through purchased care network providers (TRICARE). This hybrid system of public and private networks is asymmetric in quality assessment and transparency. The Board noted that patients deserve a similar quality of care and level of safety, regardless of where care is delivered.

A series of U.S. News & World Report articles<sup>1-3</sup> reported on the outcomes of 10 surgical procedures<sup>i</sup> performed between 2012 and 2016 in the MHS direct care network. These 10 operations were included in the Surgical Volume Pledge adopted in 2015 by Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and the University of Michigan Health System. For the Second Report of this tasking, the Board included the purchased care network in its assessment of the relevance of the Volume Pledge. The Board compared the purchased care and direct care quality and patient safety programs; added context with additional perspectives on the Volume Pledge and other public health care facility quality scorecards; reviewed surgical professional society programs in quality; and updated the status of DoD and DHA medical readiness initiatives.

The original tasking uses the phrase “low-volume high-risk” surgical procedures. The Board acknowledges the intention of this phrase. However, rigorous fact-finding efforts, including interviews and briefings with more than 55 subject matter experts in the DoD, civilian sector, and other federal agencies (see Appendix J), as well as an extensive literature review, led the Board to reconsider this concept. The Board uses the phrase “low-intensity surgical environments” in place of “low-volume high-risk” to allow for the fact that risk is a dynamic variable that can change in different environments. As defined in the first report of this tasking, low-intensity surgical environments perform procedures for healthier patients with few comorbid conditions, have a lower frequency of procedures, and/or exist with a more basic facility infrastructure and team expertise.<sup>4</sup>

### **SURGICAL OUTCOMES ARE DIRECT MEASURES OF QUALITY**

Studies of the level of surgical care experience and efforts to improve outcomes are not exclusive to the military and have been strong initiatives in the civilian health care sector for decades. The

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<sup>i</sup> Esophageal cancer resection, lung cancer resection, pancreatic cancer resection, rectal cancer resection, carotid artery stenting, complex abdominal aortic aneurysm repair, mitral valve repair, bariatric staple surgery, knee replacement, hip replacement



literature has historically noted an association between better patient outcomes for specific complex operations and performance at hospitals or by surgeons with higher numbers of certain complex operations.<sup>8-14</sup> Increased hospital volume is often correlated with lower complication rates, lower re-operation rates, lower readmission rates, lower mortality rates, and lower costs.<sup>9,10,24-30</sup> Certain procedures demonstrate a greater association than others. A consensus opinion from thirty years of literature is that physicians and hospitals with the highest numbers of certain complex surgical procedures achieve the best results. See Appendix B for more information.

The widely cited volume-outcome study by Birkmeyer and colleagues (2002) suggests that the relative importance of hospital volume varies by procedure for individual patients.<sup>9</sup> Study results informed the development of standards to reduce the surgical mortality associated with several procedures; these standards provided the impetus for the Surgical Volume Pledge (i.e. the Volume Pledge).<sup>31</sup> In co-founding the Volume Pledge, Birkmeyer cited the large body of evidence in favor of the volume-outcome relationship, noting that higher volume was generally associated with better patient outcomes.<sup>8,32</sup>

### **The Surgical Volume Pledge**

In May 2015, Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System created the Volume Pledge by committing their hospitals and surgeons to meeting annual volume thresholds for 10 “low-volume high-risk” surgical procedures.<sup>32</sup> Hospitals and surgeons that perform fewer than the volume threshold are not permitted to perform that specific procedure, and patients are directed to seek care at another center that meets the minimum volume requirement.<sup>8,33</sup> Within their academic medical systems, the facilities pledge to direct surgical care for certain procedures to facilities meeting the thresholds. The 10 surgical procedures were selected by roundtable consensus from six expert panels of six surgeons per panel from various specialties at the three founding Volume Pledge organizations and appeared to have the strongest link between hospital volume and patient mortality.<sup>8,32</sup> The Volume Pledge does not specify requirements for performing complex surgery in small and rural hospitals.<sup>7,34</sup> See Appendix D for more information.

Investigation of the impact of the Volume Pledge on outcomes and access to care through discussion with founding institutional leaders and literature review found limited evidence that the Volume Pledge has been effective in promoting surgical quality and safety.<sup>15</sup> Moreover, recent research has identified significant methodological limitations in earlier volume-outcome studies. These include weaknesses in statistics, arbitrary cut-off points (volume thresholds), exclusion of total surgeon and surgical team experience, and failure to consider the patient’s level of risk.<sup>15-21</sup> These factors, coupled with the need to distinguish between association and causation, argue for reconsideration of prior results.

In sum, while there appears to be a correlation between surgical volume and outcomes, there is more to the story.<sup>35</sup> Positive surgical outcomes reflect more than volume; good surgical technique and judgment, team proficiency, proper support services, sound hospital structural processes, and appropriate surgical candidate selection are essential.<sup>36</sup> Use of absolute volume



thresholds is arbitrary and does not account for longitudinal experiences of people, teams, and services within the surgical environment.<sup>15,16</sup>

Further, a system that regionalizes complex operations to hospitals based on volume thresholds alone may create economic and social hardships for patients and families due to prolonged displacement from their support communities, increase disparities in access to surgical care based on ability to travel, and worsen the maldistribution of the surgical workforce due to practice limitations.<sup>10,37,38</sup> See Appendix B for more information.

The Board concluded that volume alone is not a sufficient predictor of quality across the MHS direct and purchased care networks, nor a definitive requirement for provider privileging. The Board's determination is consistent with the decisions of all but three of the 6,210 U.S. hospitals that have not taken the Volume Pledge.

### **Why Other Institutions Have Not Adopted the Surgical Volume Pledge**

Many civilian and government health care systems have alternate approaches to patient safety and surgical quality that do not focus solely on volume. For example, in 2010, the Department of Veterans Affairs (VA) published the *Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures* (Veterans Health Administration [VHA] 2010-018<sup>39</sup>) that requires each VHA medical facility with an inpatient surgical program to have an infrastructure-based surgical complexity designation to address specific problems of quality of care.<sup>21,40</sup> In the first report, the Board recommended that "the MHS must adopt an infrastructure approach similar to that within the VA (VHA 2010-018<sup>39</sup>)."<sup>4, p.14</sup> See Appendix D for more information.

Many civilian health care quality leaders, including Kaiser Permanente, Mayo Clinic, and Massachusetts General Hospital (MGH), have not joined the Volume Pledge and instead rely on multi-dimensional, proactive quality systems that use risk-adjusted, benchmarked outcomes for monitoring, measuring, and improving outcomes. These systems recognize the importance of facility infrastructure and surgeon/surgical team skill proficiency. These leading health care systems also incorporate surgeon inter-facility rotations, simulation-based training, telemedicine, and other novel technologies to maintain high level proficiencies. See Appendix D for more information.

Kaiser Permanente addresses quality outcomes through simulation, systematic pre-operative patient optimization, peer review of operative video recordings, and deliberate distribution of complex cases between low- and high-volume hospitals and surgeons.<sup>37</sup> Kaiser Permanente recognizes the need for flexibility with volume recommendations and the unintended consequences of strict thresholds below which surgeons must stop performing a procedure or increase annual procedure volumes.<sup>37,41</sup> See Appendix D for more information.

Mayo Clinic's approach to quality entails electronic health record (EHR) data mining, use of risk-adjusted outcomes through the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP), and internal performance improvement processes designed to identify and address quality issues as soon as they occur.<sup>42</sup> Mayo Clinic did not join



the Volume Pledge because leaders questioned its value in a quality-minded, high-volume center.<sup>42</sup>

MGH monitors outcomes closely through NSQIP and other national comparative registries, with particular attention to high-intensity cases.<sup>43</sup> Facilities within the MGH system will refer patients elsewhere when they cannot support the level of complexity, such as complex reconstructions.<sup>43</sup> MGH did not join the Volume Pledge, despite exceeding the minimum number for all types of procedures specified in the Volume Pledge.<sup>43</sup> Clearly, the Volume Pledge benefits a “high-volume” hospital by driving more volume (and revenue). MGH saw the Volume Pledge as inconsistent with, and a potential distraction from, its institutional approach to optimizing operative outcomes.<sup>43</sup> MGH sees optimizing site of care as more nuanced.<sup>43</sup> See Appendix D for more information.

### **Begin With the End in Mind: Risk-Adjusted and Benchmarked Outcomes**

Fundamentally, surgical performance improvement requires looking at results that matter to patients and surgeons. Risk-adjusted and benchmarked surgical outcomes in morbidity and mortality are available through professional society programs, such as the ACS NSQIP, Trauma Quality Improvement Program (TQIP), and the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP).<sup>44</sup> These programs measure and improve the quality of surgical care by aggregating data from multiple institutions to establish nationally validated, risk-adjusted, observed-to-expected outcomes ratios for mortality and complications by facility.<sup>44-46</sup> Participation in these programs is voluntary, and reports are provided to institutions with strict confidentiality.<sup>46</sup> Systems can establish their own benchmarks through the program and stimulate improvement through collaboratives.<sup>46</sup> Standards are better defined as benchmarks, and evidence-based guidelines are developed, based on analysis of high-performing hospitals.<sup>44</sup>

NSQIP originated in the VHA.<sup>21,47</sup> It uses data from each patient’s medical chart (not insurance claims), adjusts for risk and case mix, and provides observed-to-expected 30-day patient outcomes.<sup>45,46,48</sup>

In 2014, 17 MTFs participated in NSQIP; by 2018, all 48 surgical inpatient MTFs were participating.<sup>45,46</sup> The overall impact of NSQIP in the direct care network has been positive over time with increased quality engagement within and across MTFs through the NSQIP collaborative.<sup>46</sup> Further, MTF case morbidity outliers and variation have decreased from January 2015 to July 2018, and median odds ratios have progressively moved below 1.0 (outcomes better than expected).<sup>46</sup> See Appendix D for more information.

Purchased care network providers and facilities are not contractually required to use NSQIP.<sup>49</sup> Those purchased care facilities that do use NSQIP are not required to share data with DHA clinical quality managers.<sup>49</sup> This lack of a standardized approach to quality assessment and data sharing in the purchased care network limits the ability to track, monitor, and compare outcomes across the enterprise.

In the first report, the Board recommended:

**Recommendation 4:**<sup>4</sup>

- A) The DoD must standardize policy and practice regarding use of NSQIP results across the system.
- B) The MHS must empower MTF NSQIP leaders to act upon outcomes in conjunction with MHS NSQIP collaboratives.
- C) The MHS must support MTF participation in national risk-adjusted registries such as, but not limited to, MBSAQIP and TQIP.

See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> for more information.

These recommendations must apply within the purchased care network as well. Surgical specialty registries, adverse event analysis through patient safety programs, and peer review are additional tools for monitoring outcomes and improving performance, regardless of the vehicle of care delivery.

## COMPARISON OF DIRECT CARE AND PURCHASED CARE QUALITY AND PATIENT SAFETY PROGRAMS

### Discrepancies in Quality Assurance across the Enterprise

The DHA manages quality in direct care, whereas Managed Care Support Contractors (MCSCs) manage quality in purchased care with oversight by DHA clinical quality managers.<sup>50,51</sup> The MHS quality and patient safety metrics are tracked in dashboards, one for each of the direct and purchased care networks. The direct care dashboard contains 64 measures while the purchased care dashboard has 18; only eight of the measures are the same, limiting comparisons at the enterprise-level.<sup>49-51</sup> The lack of standardization of measures across direct care and purchased care networks significantly impedes comprehensive monitoring, tracking, and comparison. Requirements for risk-adjusted outcome measures also differ across the MHS: NSQIP is required and used in all 48 surgical inpatient MTFs, but it is not required for the TRICARE MCSCs.<sup>49,50</sup> Finally, there is no systematic method for connecting direct and purchased care data to risk-adjusted, benchmarked data in the deployed setting.<sup>51</sup> See Appendix C for more information.

### Management of Quality and Safety Across the Enterprise

Quality assurance and patient safety across the enterprise are essential lines of effort as the DHA assumes management and administration of all MTFs pursuant of *National Defense Authorization Act for Fiscal Year 2017 (NDAA FY 2017) Section 702*.<sup>52</sup> Planning for an integrated and standardized quality assurance and patient safety capability across the direct and purchased care networks is underway.<sup>53</sup> A description of the future state is provided below.

In the *Section 702* transition, existing DHA processes and staffing are insufficient for quality oversight across the direct and purchased care networks. The Board underscores the importance of rapid implementation of quality and safety programming that is (1) appropriately staffed and



resourced; (2) fully funded; and (3) standardized across the direct and purchased care networks. Quality assurance and patient safety in the deployed environment must be considered in this programming as well.

The DHA intends to publish the DHA Clinical Quality Management (CQM) procedure manual in July 2019.<sup>53</sup> This manual describes the procedures for each of the six programs comprising CQM: (1) Patient Safety, (2) Health Care Risk Management, (3) Credentialing and Privileging, (4) Accreditation and Compliance, (5) Clinical Measurement, and (6) Clinical Quality Improvement.<sup>53</sup> Procedures described will be applicable to operational environments to the extent practicable, and guide relevant standards in purchased care as stipulated in respective contracts.<sup>53</sup>

The Clinical Measurement Program supports the DHA Deputy Assistant Director for Medical Affairs (DAD-MA) with analysis and recommendations on the use of measures addressing the quality strategy.<sup>53</sup> As discussed in the first report of this tasking, there is nascent establishment of multidisciplinary Clinical Communities to develop patient-centered care pathways that decrease variance and improve outcomes.<sup>53</sup> Care pathways are to address a patient's experience holistically, to include navigating health care services in both direct and purchased care.<sup>53</sup> In addition, quality measures that apply to both direct and purchased care at the provider level, would facilitate assessing the effectiveness of the DHA's efforts.<sup>53</sup> An action plan has been developed by the DHA Clinical Measurement Program, in conjunction with the DHA TRICARE Health Plan, to collaborate with the Centers for Medicare and Medicaid Services (CMS) and the National Quality Forum (NQF) to determine additional opportunities for integration of direct and purchased care measures.<sup>53</sup> See Appendix C for more information.

For purchased care, the *TRICARE Operations Manual (TOM)* requires contractors (MCSCs, Uniformed Services Family Health Plan [USFHP], and TRICARE Overseas Program) to operate through Clinical Quality Management Plans (CQMPs).<sup>54</sup> CQMPs must "demonstrate how the contractor's goals and objectives, leadership, structure, and operational components are designed to achieve the efficient and effective provision of timely access to high quality health care."<sup>54</sup> TRICARE contracted facilities must be accredited by independent bodies, such as The Joint Commission or the Commission on Accreditation of Rehabilitation Facilities.<sup>50</sup> The CQMP includes quality improvement initiatives and projects, potential quality issue investigations, oversight of patient safety, and the peer review organization committee.<sup>49</sup> While the MCSCs are able to apply their own "best practices" and approaches within the CQMP, quality of care must be the same across facilities and for all beneficiaries.<sup>49</sup> It is unclear how quality activities from the MCSCs are received, reviewed, and addressed by the DHA clinical quality managers.

Processes to modify, update, or expand the TRICARE benefit are complex due to statutory and regulatory constraints, including changes mandated through the annual NDAA.<sup>55</sup> Once regulatory guidance is final, the *TOM*, which governs the operations, policy, reimbursement, and systems of the MCSCs, must be updated, as well as the contracts.<sup>55</sup> See Appendix C for more information.



## The 10 “Low-Volume High-Risk” Surgical Procedures in the Direct and Purchased Care Networks

In the first part of this tasking, the Board was charged to review the 10 “low-volume high-risk” surgical procedures performed by military surgeons at MTFs. Examination of quality was challenging due to inaccurate administrative data, personnel resources, and coding tools.<sup>4</sup> The Board concluded that “Current Procedural Terminology (CPT) codes are used in the MHS primarily for workload reporting and third-party billing. They are used secondarily in quality and safety metrics. There are discrepancies between surgical services, MTF, and MHS reported volumes due to inaccurate coding. There is a lack of resources for coding accuracy and analysis.”<sup>4, p.12</sup>

In this Second Report, the Board was charged with reviewing the 10 “low-volume high-risk” surgical procedures performed for MHS beneficiaries in the purchased care network. While it was possible to determine how many of the specified surgeries were performed on patients in purchased care, the data were otherwise unhelpful. Purchased care patient data are derived from aggregated administrative claims data and represent only the care delivered through purchased care.<sup>56</sup> Because such patients make up only a portion of surgeon and facility cases, the volume of care by surgeon and facility is unknown. See Appendix C for more information.

### Parity in Quality and Patient Safety Measurement in the Enterprise

The first report examined the patient safety and quality programs within the MHS direct care network, and the Board made the following recommendation:

#### **Recommendation 2:**<sup>4</sup>

- A) The MHS quality program must continue to use a quality assessment model that leverages risk-adjusted data, such as NSQIP, to focus on patient outcomes by institution and across the MHS.
- B) MHS leaders must regularly demonstrate that quality improvement and high reliability are valued at all levels of the MHS through openness to identify and address problems, engagement by surgical programs in professional society verification activities, and participation in inter-institutional collaborative to share best practices.
  - a. The MHS quality program must continue to focus on a performance improvement model that leverages risk-adjusted NSQIP data, patient outcomes, and partnerships.
  - b. Regulation and policy barriers for confidentiality of patient safety and quality assurance records, such as *10 U.S.C. 1102* and associated policies must be modified so that safety and quality information cannot be used in a punitive way with regard to individuals, as it hinders open discussions of issues. The VHA has employed this non-punitive approach as facilitated by *38 U.S.C. 5705* and associated policies to ensure similar protection against punitive use of safety and quality data is mandated by the *Patient Safety and Quality Improvement Act of 2005*. Following the recommendations of *Optimal Resources for Surgical Quality and Safety* by the ACS, the most effective surgical quality-improvement leaders seek to establish a culture where quality improvement and high reliability are valued and requires an explicit infrastructure including policies and procedures that facilitate the achievement of this goal that are built on accountability and



- fairness for all team members and encourages open and honest discussions of vulnerabilities and problems.
- C) The MHS must adopt a continuously learning healthcare system within the MHS to facilitate the improvement of patient safety and quality.
- a. A comprehensive view of quality includes NSQIP data, registries and databases derived from electronic health records (EHR), identification of adverse events and care vulnerabilities through the DoD PSP, peer-review programs, and ongoing system analysis.

See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> for more information.

These same recommendations must apply to the purchased care network. Significant enhancements in DHA information management systems are required to manage enterprise-wide quality and patient safety programs.

## RESOURCES RELATIVE TO WORKLOAD IN OVERSIGHT OF DIRECT CARE AND PURCHASED CARE QUALITY AND SAFETY

The DHA leadership has high visibility on direct care quality and safety and reviews all sentinel events.<sup>51</sup> However, DHA leadership has lesser visibility of purchased care quality and safety and little to no visibility on quality and safety in deployed environments.<sup>51</sup>

The DHA execution of CQM (*NDAA FY 2017 Section 702*) has been challenging because the DHA has had minimal capability for Health Care Risk Management, Credentialing and Privileging, Accreditation and Compliance, and Clinical Quality Improvement, and very little capability, when compared to the Services, in Patient Safety and Clinical Measurement.<sup>53</sup> These programs have only recently been defined, and the standardization of the many complex CQM processes and procedures across the Services is in progress.<sup>53</sup> The Service Surgeons General will remain Privileging Authorities in respective operational environments, but will need to implement the DHA-Procedural Manual to the extent practicable.<sup>53</sup> See Appendix D for more information.

As CQM programs are developed, DHA internal processes and procedures will need to be established, to include how to share knowledge with the DHA Markets/MTFs and the Services, as well as appropriate staffing. Currently, there is limited staffing for the direct care quality program.

For purchased care, the newly developed DHA Policy and Integration Division is responsible for oversight of clinical quality for up to 9.5 million beneficiaries across two large, complex TRICARE MCSCs, and the OCONUS contract.<sup>49,50</sup> This Division has two medical directors (for TRICARE East and West) and three quality nurse consultants, two of whom oversee the six Uniformed Services Family Health Plan designated provider sites.<sup>49,50</sup>



For a system of this scale, the number of people and resources should be comparable to high quality civilian health care systems and managed care plans to optimize quality and patient safety.

## PROFESSIONAL SOCIETY INITIATIVES IN INFRASTRUCTURE FOR QUALITY CARE

The American College of Surgeons (ACS) has developed various quality improvement programs that complement facility patient safety and quality programs. Patient safety and surgical quality depend on a variety of factors including training, experience, and skills of the surgeon, as well as the availability of institutional resources (i.e. facility infrastructure) and ability to measure surgical outcomes.<sup>57</sup>

The ACS's quality improvement programs are based on four key principles:

- (1) Set the standards.
- (2) Build the right infrastructure (to support the standards).
- (3) Use the right data (to measure against the set standards).
- (4) Verify with outside experts (peer review verification).<sup>58,59</sup>

Standards for surgical quality and safety are codified in the ACS *Optimal Resources for Surgical Quality and Safety* manual (i.e., the "Red Book").<sup>44</sup> The structure for this manual derives from successful models in other ACS quality programs, including the Commission on Cancer, the Committee on Trauma, MBSAQIP, NSQIP, and the Children's Surgery Verification Program.<sup>44,59</sup> Based on the "Red Book," the ACS is piloting the Surgical Quality Verification program that assesses an organization's programmatic approach for surgical quality.<sup>44,59,60</sup> In 2018, Walter Reed National Military Medical Center (WRNMMC) was the first MTF to participate in the ACS Surgical Quality Verification pilot program.<sup>61</sup> See Appendix D for more information.

## UPDATES IN DEPARTMENT OF DEFENSE AND DEFENSE HEALTH AGENCY MEDICAL READINESS

### **Knowledge, Skills, and Abilities (KSA) Initiative**

The Knowledge, Skills, and Abilities (KSA) program was initiated by the Uniformed Services University Department of Surgery to provide a consistent method for quantifying surgical readiness by mapping relevant surgical skills from pre-deployment operations.<sup>6,62</sup> Operations relevant to readiness are captured cumulatively by a particular surgeon through the work component of relative value units (RVUs) by operation as a KSA score.<sup>62</sup> This score can be compared to annual cumulative thresholds defined by surgical specialty and then used to enhance individual surgeon and institution surgical experience through recapture of high value cases, civilian partnerships, and attention to coding.<sup>62</sup> The KSA program recognizes that, to a certain extent, some elective surgical skills are transferable to trauma operations.<sup>62</sup>



Using an Accreditation Council for Graduate Medical Education (ACGME)-based case counting methodology, a Tri-Service team has identified eight critical wartime specialties (general surgery, orthopedic surgery, critical care, emergency medicine, anesthesiology, emergency room nursing, critical care nursing, and trauma surgery), with approximately 3,790 KSAs.<sup>62</sup> Eight additional KSA specialties are expected to be implemented in June 2019, including ophthalmology, oral and maxillofacial surgery, cardiothoracic (CT) surgery, plastic surgery, urology, vascular surgery, otorhinolaryngology, and neurosurgery.<sup>62</sup>

In the first part of this tasking, the Board acknowledged that the KSA model is still in early stages as a pilot program and has only been linked to outcomes in the National Capital Region-Medical Directorate (NCR-MD).<sup>4</sup> Since then, methodological updates to both General Surgery and Orthopedic Surgery have led to greater accuracy for the metric and change for the NCR-MD.<sup>62</sup> Results indicate that the NCR-MD has 16% of General Surgeons meeting the KSA threshold, with 72% of Orthopedic Surgeons meeting the new threshold of 35,000.<sup>62</sup> Fort Belvoir Community Hospital (FBCH) and WRNMMC collectively captured 39% of the total KSA points available in the market for General Surgery.<sup>62</sup> Orthopedics is currently capturing 37% of the total KSA points available in the market.<sup>62</sup>

Furthermore, surgical optimization efforts to recapture KSA cases, collaborate with the VA, and partner locally to embed surgeons in higher intensity clinical environments, are underway.<sup>62</sup> While incremental progress has been made, synchronization of effort across Services is needed to realize the goals. See Appendix B for more information.

In the first part of this tasking, the Board recommended, “The KSA program must be supported to validate its role in maintaining surgical readiness. The roles of telemedicine, telepresence, and telesurgery with specialties to fill KSA gaps must be explored.”<sup>4, p.12</sup> As the KSAs continue to expand, the program has the potential to drive surgeon readiness in a quantifiable way across many specialties.

### **Partnerships with Civilian Institutions and Federal Agencies**

The MHS has clinical training and sustainment partnerships at multiple levels, to include educational partnership agreements (EPAs) and Service-specific agreements at the operational level and local MTF agreements at the tactical level.<sup>63</sup> The extent to which oversight of these partnerships within and across Services is coordinated remains unclear.

The DHA has EPAs with the VA, the Department of Health and Human Services (HHS), and the ACS.<sup>64</sup> In January 2018, the DHA J-9 Directorate established an EPA with the University of Texas Health System (UT), which includes eight universities and six health systems.<sup>65</sup> Part of this EPA includes the DHA M2 Pilot–JTS/UT Appendix C: Trauma Team Training to Support Operational Readiness KSAs. The Joint Trauma System (JTS) drives the content of the agreement, while the DHA J-9 Directorate administratively organizes the agreement.<sup>64</sup> The purpose of the JTS/UT Pilot is to develop a template for standardized partnerships for surgical training and readiness.<sup>64</sup> The DHA J-9 Directorate is evaluating its partnership methodology and addressing licensure, liability, and scope of practice issues.<sup>64</sup> As mentioned in the first part of this tasking, the Services and many MTFs have established agreements for surgical training,



proficiency, and readiness.<sup>4</sup> The EPA does not necessarily replace local agreements, but provides a standard framework for sustainment and mitigating risks from transient personnel.<sup>64</sup> The DHA partnership template can be improved by including KSA thresholds in training curricula and expected program outcomes.

There are opportunities to expand the MTF patient population based on *NDAA FY 2017 Section 717*, which allows a veteran or civilian to be evaluated and treated at an MTF if:

- (1) The evaluation and treatment of the individual is necessary to attain the relevant mix and volume of medical casework required to maintain medical readiness skills and competencies of health care providers at the facility;
- (2) The health care providers at the facility have the competencies, skills, and abilities required to treat the individual; and
- (3) The facility has available space, equipment, and materials to treat the individual.<sup>52</sup>

See Appendix B for more information.

### **Blueprint Guidelines for Military-Civilian Partnerships in Training, Sustaining, Retention, and Readiness**

The goal of the Military Health System Strategic Partnership with the American College of Surgeons (MHSSPACS) is “to improve educational opportunities, systems-based practices, and research capabilities in surgery.”<sup>66</sup> One MHSSPACS effort is the standardization of military-civilian partnership guidelines. The *NDAA FY 2017 Section 708* provides for the establishment of a Joint Trauma Education and Training Directorate to ensure that the trauma providers of the Armed Forces maintain readiness for rapid deployment in future conflicts.<sup>52,67</sup> Included is the establishment of additional military-civilian partnerships designed to maintain professional competency for military medical personnel.<sup>52,67</sup> The MHSSPACS is leading the efforts to set standards by which all military-civilian partnerships will be chosen, validated, and evaluated.<sup>67</sup> These guidelines, known as the “Blue Book,” are scheduled to be completed in 2019 and then formalized in a publication that is modeled after other ACS standard-setting documents (e.g., *Optimal Resources for the Care of Injured Patients*).<sup>67</sup>

The “Blue Book” will include seven chapters: (1) Goals and Objectives; (2) The Clinical Readiness Program (i.e. the KSAs); (3) Partnership Models (including standard language for a Training Affiliation Agreement [TAA]/Memorandum of Understanding [MOU]); (4) Partnership Objectives and General Characteristics; (5) Selection Criteria; (6) Performance Evaluation; and (7) Value of Partnerships.<sup>67</sup> See Appendix D for more information.

### **LIMITATIONS**

The Board was tasked to conduct a review addressing “low-volume high-risk” surgical procedures within the MHS over two six-month taskings (see Charge to the Defense Health Board). While the second part of the tasking included only two objectives, both were equally complex and multi-pronged. In addition, due to the expedited timeline of the report, there may be certain constraints that limited ability to address more fully the scope in detail. Because there



are limited data related to purchased care quality of care, with most data derived from claims, it was difficult to review and assess purchased care quality, including outcomes, and compare to direct care. Also, due to lack of data, there was an inability to understand the array of “low-volume high-risk” surgical procedures performed in the purchased care network on beneficiaries.

## FINDINGS AND RECOMMENDATIONS

For the Second Report of this tasking, the Board broadened its focus to look at surgical care provided in the purchased care network (TRICARE) and identified opportunities to effectively assure standardization across the MHS in a singular program of quality and safety.

### **Finding 1:**

- A) Surgical volume is an imperfect surrogate measure of surgical quality.
- B) Out of 6,210 hospitals in the U.S., only three academic institutions (Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System) adopted a version of the Surgical Volume Pledge, and only one remains a strong proponent (Johns Hopkins Medicine). The 10 “low-volume high-risk” operations contained in the Surgical Volume Pledge were developed by roundtable consensus from only these three institutions.
- C) The ACS National Surgical Quality Improvement Program (NSQIP) is a nationally validated, clinical risk-adjusted, and outcomes-benchmarked program that improves the quality of surgical care.
  - i) NSQIP is used by all 48 surgical inpatient MTFs in the direct care network.
  - ii) NSQIP participation is not a requirement for surgical care organized through the TRICARE Managed Care Support Contractors (MCSCs).
  - iii) Purchased care facilities that use NSQIP are not required to share data with the DHA clinical quality managers.

### **Recommendation 1:**

- A) The MHS should not use volume data as a sole measure of surgical quality or sole requirement for surgical privileging.
- B) The MHS should not join the Surgical Volume Pledge.
- C) The DHA must require that all institutions providing surgical care in the direct care and purchased care networks (1) participate in NSQIP; (2) assess outcomes through surgical specialty registries, patient safety programs with adverse event analysis, and peer-review programs; and (3) share findings from NSQIP, surgical registry, patient safety, and peer-review programs with the DHA.

### **Finding 2:**

- A) The MHS does not have a comprehensive program for quality assurance and patient safety that covers the direct care, purchased care, and deployed care networks.
- B) The MHS purchased care network does not collect risk-adjusted outcomes data. Currently, patient population data from the purchased care network is derived from aggregated administrative claims data from submitted TRICARE claims.
- C) There are limited standard metrics and analytics for comparison of quality in direct care and purchased care institutions. Currently, the direct care quality dashboard has 64 measures,



whereas the purchased care dashboard has 18 quality measures. Only eight of the measures are the same for direct care and purchased care.

**Recommendation 2:**

- A) The DHA must integrate direct care and purchased care quality management to ensure that care is of the highest quality in both networks and consider how to integrate care in the deployed environment into the MHS quality program.
- B) The MHS must use a standard quality framework for consistent analysis of risk-adjusted data and with a focus on patient outcomes. The DHA quality program must drive a continuously learning health care system for ongoing improvement in patient safety and quality.
- C) The DHA must standardize quality metrics for tracking of quality in both networks in a unified dashboard that is focused on risk-adjusted, benchmarked outcomes.

**Finding 3:**

The DHA is responsible for oversight of quality of care and patient safety for 9.5 million beneficiaries in both direct care and purchased care networks that include two large, complex TRICARE MCSCs and MTFs domestically and overseas. There is a very significant lack of staff and resources to oversee quality and patient safety across the enterprise.

**Recommendation 3:**

The DHA must provide adequate staff and resources equivalent to leading civilian health systems and managed care plans, to enable effective and efficient quality assurance across the purchased care and direct care networks.

**Finding 4:**

- A) Professional society verification of infrastructure relative to standards in trauma, cancer, and bariatric surgery centers has improved patient outcomes.
- B) The ACS has initiated a Surgical Quality Verification program, based on the *ACS Optimal Resources for Surgical Quality and Safety* (“the Red Book”) manual, to promote standards and better outcomes. The ACS Surgical Quality Verification program has been piloted at four facilities, including one military treatment facility (Walter Reed National Military Medical Center [WRNMMC]).

**Recommendation 4:**

The DHA should continue to evaluate and implement surgical quality verification programs by professional societies across facilities in direct care and purchased care networks.

**Finding 5:**

- A) The Knowledge, Skills, and Abilities (KSA) project continues to expand with the addition of eight KSAs for implementation in June 2019.
- B) *NDAA FY 2017 Section 717* permits civilians and veterans to be evaluated and treated at MTFs in order to support relevant patient care experiences that sustain medical readiness skills and competencies.
- C) The DHA has multiple pathways for military-civilian partnerships, including local agreements between MTFs and civilian institutions, Service agreements with civilian institutions, and educational partnership agreements (EPAs) between the DHA and other



organizations (to include the VA, the Department of Health and Human Services, and the ACS). There is a lack of curricular consistency, inter-Service coordination, and verification of training outcomes across these partnerships.

**Recommendation 5:**

- A) The DoD must continue to support the KSA program with resources for expansion and tracking of outcomes that demonstrate improvement in medical readiness.
- B) The DHA must continue to expand civilian and VA partnerships that sustain surgical readiness through enhanced clinical experience.
- C) The DHA must promote inter-Service collaboration by developing a framework for consistent implementation, monitoring, and verification of all partnership agreements, to include education and training goals, curricula, and authentication of outcomes.



**APPENDIX A. CROSSWALK BETWEEN TERMS OF REFERENCE OBJECTIVES AND REPORT RECOMMENDATIONS**

Terms of Reference		Board Recommendations
I	Review the array of low-volume high-risk surgical procedures performed on MHS beneficiaries in the purchased care system (TRICARE).	<p><b>2A.</b> The DHA must integrate direct care and purchased care quality management to ensure that care is of the highest quality in both networks and consider how to integrate care in the deployed environment into the MHS quality program.</p> <p><b>2B.</b> The MHS must use a standard quality framework for consistent analysis of risk-adjusted data and with a focus on patient outcomes. The DHA quality program must drive a continuously learning health care system for ongoing improvement in patient safety and quality.</p> <p><b>2C.</b> The DHA must standardize quality metrics for tracking of quality in both networks in a unified dashboard that is focused on risk-adjusted, benchmarked outcomes.</p> <p><b>3.</b> The DHA must provide adequate staff and resources equivalent to leading civilian health systems and managed care plans, to enable effective and efficient quality assurance across the purchased care and direct care networks.</p>
II	Evaluate potential for the MHS to sign on to the “Surgical Volume Pledge” agreed to by Dartmouth-Hitchcock Medical Center, Johns Hopkins Medicine, and the University of Michigan.	<p><b>1A.</b> The MHS should not use volume data as a sole measure of surgical quality or sole requirement for surgical privileging.</p> <p><b>1B.</b> The MHS should not join the Surgical Volume Pledge.</p> <p><b>1C.</b> The DHA must require that all institutions providing surgical care in the direct care and purchased care networks (1) participate in NSQIP; (2) assess outcomes through surgical specialty registries, patient safety programs with adverse event analysis, and peer-review programs; and (3) share findings from NSQIP, surgical registry, patient safety, and peer-review programs with the DHA.</p>
III	Other recommendations regarding objectives from the first report of the tasking.	<p><b>4.</b> The DHA should continue to evaluate and implement surgical quality verification programs by professional societies across facilities in direct care and purchased care networks.</p> <p><b>5A.</b> The DoD must continue to support the KSA program with resources for expansion and tracking of outcomes that demonstrate improvement in medical readiness.</p> <p><b>5B.</b> The DHA must continue to expand civilian and VA partnerships that sustain surgical readiness through enhanced clinical experience.</p> <p><b>5C.</b> The DHA must promote inter-Service collaboration by developing a framework for consistent implementation, monitoring, and verification of all partnership agreements, to include education and training goals, curricula, and authentication of outcomes.</p>



## APPENDIX B. INTRODUCTION, BACKGROUND, AND UPDATES TO THE FIRST REPORT

### B.1 INTRODUCTION

#### REQUEST TO THE DEFENSE HEALTH BOARD

On March 28, 2018, the Acting Assistant Secretary of Defense for Health Affairs requested that the Defense Health Board (the Board) provide recommendations to improve policies for managing facility surgical capabilities and surgeon proficiency.

Specifically, the Board was asked to address and develop findings and recommendations on the policies and practices in place to:

- Determine where high-risk surgical procedures should be performed,
- Optimize the safety and quality of surgical care provided,
- Enhance patient transparency related to surgical volumes and outcomes, and
- Evaluate the contribution of high-risk surgical procedures to medical readiness.

To accomplish the above objectives, the Board's Trauma and Injury (T&I) Subcommittee was tasked with two six-month taskings. This is the second report and addresses the following objectives from the Terms of Reference (TOR):

- Review the array of low-volume high-risk surgical procedures performed on MHS beneficiaries in the Purchased Care System (TRICARE).
- Evaluate potential for the MHS to sign on to the "Surgical Volume Pledge" agreed to by Dartmouth-Hitchcock Medical Center, Johns Hopkins Medicine, and the University of Michigan.

The first six-month report (See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*) addressed the following objectives:

- Review the array of low-volume high-risk surgical procedures performed by military surgeons in the Direct Care system at military treatment facilities (MTFs).
- Evaluate policies, protocols, and systems for managing facility surgical capabilities and surgeon/staff proficiency across each of the service branches.
- Develop recommendations to advance standardized policies on managing facility infrastructure capabilities and individual surgeon/supporting staff proficiency across all Service branches.
- Evaluate potential MHS applicability of Veterans Health Administration (VHA) Operative Complexity Directives:
  - "Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures" (VHA 2010-018)
  - "Facility Infrastructure Requirements to Perform Invasive Procedures in an Ambulatory Surgery Center" (VHA 2011-037)



- Examine the contribution (Knowledge, Skills, and Abilities [KSAs]) of low-volume high-risk procedures to military medical readiness (e.g., surgeons, operating room staff).
- Evaluate MHS policies related to surgical volume transparency and public release of volume, errors, and outcomes data.
- Provide recommendations on using the volume, errors and outcome data to inform and enhance policies for managing surgical capabilities and surgeon currency.

## GUIDING PRINCIPLES

The Board adopted the following guiding principles as a foundation for its review (Figure 1).

**Figure 1.** Guiding Principles

**Overarching Principle:** It is the duty of the Department of Defense (DoD) to enhance patient safety and deliver safe and high-quality care to active duty personnel, military retirees, and their beneficiaries through services provided directly at military treatment facilities (MTFs) and through the TRICARE purchased care network.

**Guiding Principles:** These principles require that the recommendations by the Board must:

- (1) Consider the impact of the volume standards within the civilian sector and the applicability of such standards to MTFs;
- (2) Identify acceptable risk levels that ensure patient safety and quality of care;
- (3) Consider the contribution of high-risk surgical procedures to medical readiness especially as it relates to combat casualty care;
- (4) Describe the impact of assuring patient safety on readiness;
- (5) Recognize the systematic considerations that impact patient safety and quality of care;
- (6) Consider patient transparency related to surgical volumes and outcomes; and
- (7) Consider the suggestions of the health care community regarding implemented volume requirements.

## METHODOLOGY

To perform a comprehensive review of surgical volume and its relationship to patient safety and quality of care and formulate findings and recommendations, the Board used several different sources to guide analysis. The Board:

- Conducted literature reviews on relevant topics.
- Received briefings from subject matter experts (SMEs) regarding the volume-outcome association, Volume Pledge institutions, the Purchased Care network and military medical readiness from within the MHS, and the civilian sector.
- Requested, analyzed, and interpreted volume, errors, and outcome data.



## B.2 BACKGROUND

Much of the information in the following section was addressed in the first part of this tasker (Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*).<sup>4</sup> However, it has been augmented with additional surgical volume-outcomes information and reorganized accordingly. An overview of TRICARE was also added here to provide further context for this report.

### INDIRECT MEASURES OF QUALITY: A BRIEF OVERVIEW OF SURGICAL VOLUME

Quality of care has been a topic of debate in the medical field for over one hundred years. In a seminal 1918 article, Codman advocated for the establishment of standards of care against which providers and hospitals could be benchmarked.<sup>68</sup> Codman argued that understanding what worked for patients, what did not, and why was imperative.<sup>68</sup> He challenged providers and hospitals to assess their value to patients, asking: “Are your [results] better or worse? Are you making any effort to find out?”<sup>68, p. 1780</sup>

The science of assessing quality has been evolving ever since. In the 1970s, researchers interested in surgical quality turned to volume as a potential marker of outcome: Did patients treated by surgeons or hospitals with a higher number of procedures have better results? The subsequent body of literature that emerged suggested “yes.”<sup>11,12,13</sup> A widely cited 1979 study by Luft, Bunker, and Enthoven, for example, found that post-operative deaths decreased as number of procedures increased.<sup>69</sup>

Follow-on studies have looked at the effects of volume on outcome at both the hospital and provider levels, including the surgical team and facility capabilities.<sup>13</sup> Findings suggest that “high-volume” surgeons are likely to have better patient outcomes than “low-volume” surgeons.<sup>13,14</sup> The caseload of a surgeon can be quantified similarly to that of an entire hospital; however, other factors should be considered regarding surgeons’ outcomes. The issue of current volume versus accumulated volume<sup>12</sup> is of importance when considering volume as a proxy for surgical quality with respect to the individual provider. There is little evidence to show several years of experience is more important for patient outcomes than experience gathered over a short period of time with a large number of procedures.<sup>12</sup> Instead, experience matters; a learning effect may explain the assumed better patient outcomes. In other words, as hospitals or surgeons gain more experience performing operations, they improve their outcomes.<sup>17</sup>

Additionally, the specific surgical procedures versus the volume also matters; experience matters more for coronary artery bypass surgery (CABG), whereas volume of vascular surgery is more important for resection/graft for abdominal aortic aneurysm (AAA).<sup>12</sup> Considering surgeon experience, one study found that annual surgical volume is related to lower inpatient mortality for operations performed by early career surgeons and general surgeons.<sup>70</sup> However, no significant differences were demonstrated for volume and inpatient mortality for late career surgeons.<sup>70</sup> Other studies have found that the volume of related surgeries matters.<sup>18,19</sup> For instance, a surgeon who specializes in one operation may have better outcomes due to repetitive experience, higher attention, and faster recall (because of less switching among different



procedures), and greater knowledge transfer from the same procedures performed with different patients.<sup>18</sup>

A 2016 study tested the hypothesis of a specialization-outcomes relationship independent of a surgeon's volume in that specific procedure.<sup>18</sup> "A surgeon performing 20 procedures of which all 20 are valve replacements (denoting 100% specialization in the procedure) would have lower operative mortality rates than a surgeon who performs 100 operations of which 40 are valve replacements (denoting 40% specialization in the procedure)."<sup>18, p.1</sup> If this scenario were to follow the volume-outcomes hypothesis, then it would suggest that selecting the surgeon who performs 40 valve replacements would lead to superior outcomes for patients regardless of the percentage of specialization of that surgery.<sup>18</sup> The theory was examined for eight of the "low-volume high-risk" surgical procedures (identified below, excluding hip and knee replacements).<sup>18</sup> Authors concluded that for six of the eight procedures, surgeon specialization was found to be an important predictor of mortality.<sup>18</sup> For five of the procedures, "the relative risk reduction in mortality from selecting a surgeon in the top quarter of surgeon specialization was greater than from selecting a surgeon in the top quarter of procedure specific volume."<sup>18, p.7</sup> Additionally, surgeon specialization accounts for some or all of the observed volume-outcomes relationship.<sup>18</sup>

Some early research suggested physician volume may be more important than hospital volume,<sup>71,72</sup> while other research did not support the hypothesis that individual surgeon volume of patients is significantly related to patient mortality.<sup>28</sup> Moreover, recent researchers often review two factors together—hospital and surgeon volume—when examining the impacts on outcomes related to patient safety. Hence, the success of patient outcomes heavily depends on the surgical team and facility, not only the lead surgeon.<sup>7</sup> More surgeon experience may minimize costs, improve the utilization of resources in the operating room (OR), shorten operative times, and produce better surgical techniques.<sup>17</sup>

### **Measuring Surgical Quality Indirectly: Implications**

Findings that volume impacted surgical outcome spurred significant debate about how results should be understood and interpreted. Some argued that higher surgical volumes lead to better outcomes ("practice makes perfect"), while others held that hospitals and surgeons with better outcomes attract more patients ("selective referral program").<sup>12,71,10,8,73,74</sup> The "practice makes perfect" argument has had significant implications for health care policy at the hospital system level, through the Surgical Volume Pledge (i.e. Volume Pledge), and potential implications for the organization of health care at the national level by lending support to the concept of "regionalization" of health care. However, other leaders in patient safety and quality have not joined the Volume Pledge and instead use a measure of surgical quality in a more direct way that does not rely on volume.

#### **Surgical Volume Pledge**

A widely cited study by Birkmeyer and colleagues (2002) suggested that the relative importance of hospital volume varied by procedure for individual patients.<sup>9</sup> Study results informed the development of standards to reduce the surgical mortality associated with several procedures; these standards provided the impetus for the Volume Pledge, further discussed in Appendix D.<sup>31</sup>



As one of the founders of the Volume Pledge, Birkmeyer cited the large body of evidence in favor of the volume-outcome relationship, noting that higher volume was generally associated with better patient outcomes.<sup>8,32</sup> Additional studies concluded that higher hospital volume is often correlated with lower complication rates, lower re-operation rates, lower readmission rates, lower mortality rates, and lower costs for specific surgeries.<sup>9,10,24-30,75</sup>

Studies focused on the surgical outcomes-volume relationship have been mixed thus far. However, acknowledging those specific studies supporting the higher volume/better outcomes results, to date, three hospital systems have signed on to the Volume Pledge: Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System. These institutions “pledged that their hospitals would meet annual volume thresholds for 10 surgical procedures.”<sup>32</sup> These facilities report that the 10 procedures “are those that have the strongest link between hospital volume and patient mortality.”<sup>32</sup> Hence, annual volume thresholds were established for both the individual surgeon and the hospital.

In contrast, other high quality facilities, such as Kaiser Permanente, Massachusetts General Hospital (MGH), and Mayo Clinic, decided not to sign on to the Volume Pledge, determining it was ultimately not in the best interest of their patients<sup>43</sup> or that quality was best assessed through other means.<sup>42</sup> See Appendix D for more information on the Volume Pledge.

### Regionalization and Potential Challenges and Consequences

Correlational findings between surgical volume and outcome gave rise to proposals to regionalize care, i.e., to consolidate specific aspects of health care (e.g., surgeries) into areas or facilities that meet particular volume thresholds for given procedures.<sup>26</sup> Supporters of regionalization argue that patients treated at “high-volume” centers often receive qualitatively different interventions and have better outcomes than patients treated at “low-volume” centers and that these benefits outweigh the challenges imposed by the need to travel to obtain care.<sup>76</sup> Supporters also contend that better outcomes (e.g., fewer complications) may translate into lower hospital costs per patient. The economics of cancer surgery are used to illustrate the potential for higher quality care at lower cost through regionalization.<sup>17</sup>

Others caution, however, that regionalization may negatively impact access and incur longer wait times for surgery, yielding greater complications or even mortality.<sup>77</sup> Associated challenges like travel burden and family strain<sup>33</sup> can impact any patient; for those with weak support systems, such challenges may become true barriers to care.<sup>77</sup> A 1999 study at a Department of Veterans Affairs (VA) hospital found a strong preference among patients for local care.<sup>25</sup> Specifically, nearly 75% of patients assessed indicated a preference for local surgery even when travel to a regional center would yield lower operative mortality risk; similarly, about 25% of patients assessed indicated they were willing to accept very high levels of local operative mortality risk in order to avoid travel for non-local care.<sup>25</sup> Organizations such as the Fisher House Foundation and Hotels for Heroes are designed to ease some aspects of the burden of medical travel; however, they can be difficult to access due to variations in eligibility criteria across military commands and locations. Further, these accommodations are not available for outpatient services, which include post-surgical care.<sup>78</sup>



Finally, Blanco and colleagues assessed the impact of regionalization in support of volume standards on care quality and access in underserved populations. Results were equivocal, leading the researchers to conclude that “volume standards would have a small impact on [an] already disadvantaged population.”<sup>30, p.843</sup>

## VOLUME AS AN INDIRECT MEASURE OF SURGICAL QUALITY: REVISITED

Over the past two decades, study of the volume-outcome relationship has expanded to include evaluations of methods and analyses used in previous research. One study re-classifies the widely cited Birkmeyer and colleagues’ (2002) paper as an outlier analysis, rather than a volume analysis.<sup>15</sup> Other research indicates that the volume-outcome relationship may be moderated or mediated by other variables, such as race, income, comorbidities, and access to care.<sup>79</sup> More significantly, recent studies question the quality and sophistication of earlier research methods and analyses, and their corresponding findings. Many surgical volume studies, for example, were based on large samples drawn from administrative data sets.<sup>20</sup> Large sample sizes more easily yield statistically significant results when the true, meaningful difference between groups (e.g., between a “low-volume” versus “high-volume” hospital) is minimal.<sup>20</sup> Additional analyses of data in these instances would provide a more accurate picture of how/if the variables are related. Other critiques of early studies raise concerns about how volume is measured.

Earlier studies tended to define volume as a dichotomized variable, an approach that Livingston and Cao caution can yield arbitrary and non-meaningful distinctions.<sup>16</sup> If “low-volume” is defined as 150 cases or less per year, for example, a surgeon who performs two procedures a year is viewed as having the same experience or skill as a surgeon who performs an appreciable number of procedures (e.g., 100) a year.<sup>15,16</sup> Similarly, in a 2011 study, authors found that the way in which volume was measured directly impacted the statistical significance of the volume-outcome relationship.<sup>20</sup> When volume was defined via quintiles, a positive association between volume and outcome (in this case, mortality) emerged.<sup>20</sup> However, when a risk-adjusted relationship via linear function or a nonlinear function using restricted cubic splines was assessed, no statistically significant relationship was found.<sup>20</sup>

Concerns have also been raised about the use of volume as a proxy variable for surgical assessment.<sup>20</sup> A true proxy variable must have a strong relationship (i.e., large effect) with outcome and must also provide considerable explanation for outcome variance (i.e., the statistical model must adequately fit the data).<sup>16</sup> Yet, few of the studies that employed regression analysis to determine a volume-outcome relationship (3.6%) reported on the degree of outcome variance that was attributable to volume.<sup>16</sup> Recommendations for increasing the methodological and statistical quality of volume-outcomes research include: (1) measuring volume as a continuous rather than dichotomous or categorical variable for greater explanatory value;<sup>15,16</sup> and (2) reporting the proportion of variance explained by procedure volume in order to demonstrate the relative importance volume has in explaining outcomes relative to other potential sources for that variation.<sup>16</sup>



## A CLOSER LOOK: THE TOP 10 “LOW-VOLUME HIGH-RISK” SURGICAL PROCEDURES

Research studies pertaining to the top 10 “low-volume high-risk” surgical procedures often report a positive association between higher volume and patient outcomes. They are divided into four categories: cancer resections (esophagus, lung, pancreatic, rectal), cardiovascular procedures (carotid artery stenting, complex abdominal aortic aneurysm, mitral valve repair), general procedures (bariatric staple surgery), and orthopedics (knee replacement, hip replacement). These 10 procedures were adopted in May 2015 by Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System as part of their Volume Pledge that created annual volume minimums for each procedure.<sup>61</sup> The 10 procedures identified by this group are those that are believed to have the strongest link between hospital volume and patient mortality.<sup>8,9,32,61</sup> However, the literature is mixed regarding the relationship between volume and surgical outcomes, as demonstrated in the following sections. These mixed results suggest that the volume-outcome relationship may be more nuanced, with variation that is influenced by specific surgical procedure, research method, and individual surgeon.

### Esophageal Cancer Resection

In a 2017 study using data from 2009 to 2011, there were 1,324 esophagectomies performed in California, Florida, and New York, of which 82.1% were conducted at low-volume hospitals.<sup>79</sup> The researchers used propensity score matching, an analysis that allows for design and observational study analysis to mimic some particular characteristics of a randomized controlled trial,<sup>80</sup> to generate balanced groups of comparison. Their results did not show a significant difference for in-hospital mortality, the presence of any complications, or the length of stay (LOS) between high- and low-volume hospitals.<sup>79</sup>

Examination of distance traveled and surgical case volume at a facility were examined for patients with esophageal cancer from 2006 to 2011.<sup>76</sup> Authors of this 2017 study also used propensity score matching and concluded that the five-year survival of patients who traveled to high-volume facilities was more than 50% higher than patients who did not travel and were treated at low-volume facilities.<sup>76</sup> While both studies used the same approach to data analysis, they demonstrated different outcome likelihoods, suggesting that other factors, such as post-operative care impact esophagectomy patient outcomes.

### Lung Cancer Resection

In the same 2017 study that examined surgical volume and outcomes for esophagectomies in California, Florida, and New York from 2009 to 2011, lung resections (lobectomy and pneumonectomy) were also studied.<sup>79</sup> For the given timeframe, 20,138 lung resections were performed, of which 61.7% were performed at low-volume hospitals (“low volume” defined as less than 40 lung resection and less than 20 esophagectomies).<sup>79</sup> This study found there was no volume effect on in-hospital mortality and no significant differences in postoperative complications when using propensity score matching.<sup>79</sup> However, LOS was significantly longer at low-volume hospitals with significantly higher charges.<sup>79</sup> The authors cautioned about using cutoff standards as they are not associated with a difference in outcomes based on the Agency for Healthcare Research and Quality (AHRQ) database used. Most patients undergo these procedures at facilities below the proposed cutoffs.<sup>79</sup>



How the variable volume is represented impacts results of the volume-outcome association for lung cancer resection patients. A 2012 study analyzed 6,248 cases from 2007 for patients who underwent operations for lung cancer with hospital volume represented three ways—as a continuous variable, using restricted cubic spline regression, and as a categorical variable.<sup>20</sup> Results indicated that hospital volume was not a statistically significant predictor of in-hospital mortality for any of the three models.<sup>20</sup> The relative contribution of volume, when modeled as quintiles, was quite small and other covariates such as congestive heart failure, age, and hypertension contribute much more to the predictive performance of the model.<sup>20</sup> The heterogeneity of results and statistical approach emphasize the need for more research into optimal statistical models for patient outcomes.

### **Pancreatic Cancer Resection**

Recent studies examining the impact of travel distance for patients undergoing pancreatic cancer resection operations show mixed findings. A 2017 study of pancreatectomy patients in California found that patients would be more sensitive to an increased travel burden if a low-volume threshold was required.<sup>81</sup> In other words, these vulnerable patients (elderly, racial minorities, self-pay patients) may be disproportionately affected by traveling for a surgical procedure.<sup>81</sup> Conversely, another 2017 study that stratified patients into two groups based on travel distance and hospital volume found that traveling longer distances for surgery at high-volume centers offset the potential benefits of receiving treatment locally.<sup>82</sup> Using data from the National Cancer Data Base from 1998 to 2012, this study also found that patients who traveled to high-volume centers experienced improved short-term outcomes and long-term mortality after pancreatic cancer resection surgery compared to those who had the operations in low-volume centers.<sup>82</sup>

A 2012 study assessed surgeon volume on outcomes of pancreaticoduodenectomy patients from 2001 to 2009 in a single high-volume facility.<sup>83</sup> The cut-off between high-volume and low-volume surgeons was defined as 12 procedures per year.<sup>83</sup> Authors concluded “no difference between high-volume surgeon and low-volume surgeon groups was found in mortality, major complication rate, and length of stay.”<sup>83, p.520</sup> These studies illustrate the complicated decision patients face when they select a provider for surgery and the potential for additional complexity, should more facilities take a volume-centered approach to pancreatic cancer resections.

### **Rectal Cancer Resection**

A 2010 meta-analysis examined literature regarding the volume-outcomes relationship and rectal cancer. Authors found that specialized colorectal surgeons performing high-volumes of rectal cancer resections showed decreased mortality and increased survival when compared to low-volume surgeons (performing less than 10/year).<sup>72</sup> Additionally, a 2008 study reviewed 22 published studies on rectal cancer surgery and found that across all studies, high hospital volume and high surgeon volume have either a beneficial or neutral effect on patient care and outcomes.<sup>84</sup>

However, a 2016 study assessed 30-day mortality outcomes among 7,798 patients undergoing either restorative or non-restorative proctectomy and found that high-volume surgeons and



hospitals were less likely to experience mortality at 30 days.<sup>85</sup> For high-volume surgeons, there was a 19% decrease in mortality for every 10 case increase.<sup>85</sup> High-volume hospitals had a similar result with a 6% decrease in mortality for every 10 case/year increase in proctectomies.<sup>85</sup> Both of these correlations were independent of hospital location and number of years since surgeon completed residency or fellowship training.<sup>85</sup> While this study supports the concept behind the Surgical Volume Pledge, the heterogeneity of the literature indicates that more clinical outcomes studies are needed.

### **Carotid Artery Stenting**

A Nationwide Inpatient Sample (NIS) from the Healthcare Cost and Utilization Project was analyzed to identify patients undergoing carotid artery stenting (CAS) between 2005 and 2009. The stroke and death rate in the CAS high-volume operator tertile, defined as 15 or more operator annual procedures, was nearly half of that observed in the low-volume operator tertile, defined as fewer than five operator annual procedures (2.3% vs 4.4%).<sup>86</sup> Another study, using administrative data from Medicare beneficiaries undergoing CAS between 2005 and 2007, concluded that the observed 30-day mortality was higher among patients treated by operators with very-low annual volumes, defined as fewer than six annual procedures, than among patients treated by operators with high annual volumes, defined as 24 or more annual procedures (2.5% vs 1.4%).<sup>87</sup>

Furthermore, an ongoing, prospective study, CAPTURE 2 (Carotid ACCULINK/ ACCUNET Post Approval Trial to Uncover Rare Events) assessed the correlation between hospital volume, individual provider volume, and death or post-operative stroke outcomes. Of the 180 centers surveyed, 118 facilities reported zero deaths or post-operative strokes for CAS procedures.<sup>88</sup> For the remaining facilities, there was an inverse relationship between CAS case volume and death and stroke outcomes, even after the authors accounted for higher rates due to low denominators.<sup>88</sup> They found a similar trend among CAS providers and death and stroke outcomes.<sup>88</sup> Of note, death and stroke rates tended to be lower for interventional cardiologists compared to other specialties such as vascular surgery, neurosurgery, and interventional radiology, suggesting that specialty might be used as an outcome indicator.<sup>88</sup> Based on these studies, it appears that surgical volume could be a rough indicator of outcomes.

### **Complex Abdominal Aortic Aneurysm Repair**

A recent sample from 2001 to 2007 included 47,033 patients who underwent intact AAA repair or presented with ruptured AAA found 5.6% of patients were treated at rural hospitals.<sup>89</sup> According to this study, “patients with ruptured AAA who [were] not transferred to another facility [had] comparable mortality whether treated at a rural or urban hospital.”<sup>89, p.1064</sup> However, the major risk at the rural facility was inability to provide care at all, resulting in transfer and delayed repair.<sup>89</sup>

In a 2007 meta-analysis of over 450,000 AAA procedures performed in the U.S. and United Kingdom, researchers analyzed annual facility volume for AAA and mortality rates.<sup>90</sup> Overall, of the 11 studies representing 68,411 elective AAA patients assessed, only one research study found no association between facility volume and outcomes, whereas six research studies demonstrated evidence of an inverse relationship between volume and outcomes.<sup>90</sup>



Some research suggests that the volume-outcome relationship for AAA may be dependent on the approach to repair. Zettervall and colleagues found significant differences between endovascular AAA repair (EVAR) and open AAA repair outcomes as they relate to mortality.<sup>91</sup> While there was no association between EVAR and hospital volume, patients with open AAA repair performed at high-volume hospitals tended to have a lower mortality rate than those patients at lower-volume hospitals.<sup>91</sup> Based on these studies, using volume as a predictor is insufficient in determining outcome success when classified as general, complex abdominal aortic aneurysm repair, as differences were found at the procedure level (AAA versus EVAR). This further suggests that other factors, such as procedure complexity and post-operative care, could influence outcomes.

### **Mitral Valve Repair**

Using data from the NIS from 1998 to 2011, a 2015 study with patients who underwent both aortic and mitral valve repair or replacement found centers performing more than eight procedures a year were superior to those performing eight or fewer.<sup>77</sup> Similar results were found for Medicare beneficiaries from 2000 to 2009—hospitals with the lowest volume of mitral procedures had substantially worse short- and long-term survival than higher-volume hospitals.<sup>92</sup> Lower mitral valve repair rates annually were independently predictive of higher operative and long-term mortality.<sup>92</sup>

A 2017 study evaluated individual surgeon volume and mitral repair outcomes using a mandatory New York State database, querying 5,475 patients with degenerative mitral disease.<sup>93</sup> The researchers also assessed mitral reoperations within 12 months of repair and repair rates as part of the outcome measures.<sup>93</sup> Higher total mitral repair volume (in patients with and without degenerative disease) was associated with increased repair rates of degenerative mitral valve disease and improved one-year survival.<sup>93</sup> Therefore, surgeons who did more procedures per year were more likely to encounter more mitral valve degenerative disease patients. Also, these surgeons' patients were more likely to survive one year later than those of low mitral repair volume surgeons.<sup>93</sup> Therefore, the results of these two studies indicate that institutional and surgeon volume can predict mitral valve repair patient outcomes.

### **Bariatric Staple Surgery**

A New York study using 2003 data found an association between surgeon volume as well as hospital volume and the likelihood of postoperative complications for adult patients undergoing bariatric surgery.<sup>14</sup> Similarly, the association between hospital volume and surgeon procedure volume and complications following bariatric surgery was also found in a 2010 Michigan study.<sup>31</sup> This study also noted that the frequency of complications within 30 days of surgery was not related to Center of Excellence accreditation by professional organizations.<sup>31</sup>

Additionally, a 2013 study analyzed 277,760 laparoscopic stapling procedures performed from 2006 to 2010 using the Nationwide Inpatient Sample dataset.<sup>94</sup> Approximately 85% of the cases studied were performed at high-volume hospitals (defined as more than 50 stapling cases/year) and 90% of which were accredited Centers of Excellence. Comparable to other studies, the high-volume hospitals had lower mortality rates than low-volume institutions.<sup>94</sup> Moreover, this study



found that non-accredited, high-volume hospitals had a higher mortality rate than accredited Centers of Excellence.<sup>94</sup> These studies show that Center of Excellence accreditation for bariatric surgery needs additional analysis. While hospital volume was shown to be indicative of outcomes, accreditation was only found to be significant in one study. Therefore, hospitals should carefully consider whether prioritizing volume or investing in accreditation for Centers of Excellence in bariatric surgery is best for their institution.

### **Knee Replacement**

Studies for total knee arthroplasty have found an association between higher surgeon volume and lower mortality, infections, transfusion rates, decreased LOS, shorter procedure times, and better outcomes.<sup>95</sup> Specifically, a 2016 study using data from 1997 to 2011 found higher surgeon volume was also associated with lower rates of revision and lower complication rates, while higher volume hospitals had lower complication rates and lower mortality.<sup>95</sup> Specifically, surgeons performing zero to 12 total knee arthroplasties a year (low-volume surgeons) had significantly higher rates of two-year revision and 90-day complications compared to medium-volume and higher-volume surgeons.<sup>95</sup> However, a 2012 study did not show the same strong relationship. Although hospital volume appeared to have more of an impact on patient outcomes for total knee replacement than surgeon volume, the association was not strong according to this 2012 study.<sup>96</sup>

Using Medicare claims data, a 2009 study measured the cost effectiveness of knee replacement and the influences of hospital volume and patient risk.<sup>97</sup> Authors found surgeons who performed more than 50 procedures/year had patients who were less likely to develop pneumonia or another adverse outcome, compared to surgeons who performed less than 2 procedures/year.<sup>97</sup> A similar effect was found in hospitals with an annual volume of more than 200 procedures/year.<sup>97</sup> These patients incurred less adverse outcomes than those patients who had their surgery in a hospital with less than 12 procedures/year.<sup>97</sup> These studies concur that the association between hospital and surgical volumes and knee replacement patient outcomes is significant and could be used as an outcomes indicator.

### **Hip Replacement**

There was an association for patients who underwent elective total hip or total knee arthroplasty (THA/TKA) between low hospital volume and higher one-year morbidity and higher risk of venous thromboembolism (VTE) for the study conducted using 2002 data from Pennsylvania.<sup>98</sup> Additionally, patients at high-volume hospitals or operated on by high-volume surgeons for THA and TKA were more likely to undergo shorter procedure durations than those in low-volume hospitals or by low-volume surgeons.<sup>99</sup>

A 2014 article in the British Medical Journal followed 37,881 patients for two years after hip arthroplasty.<sup>100</sup> After identifying a 35 cases/year threshold for high-volume surgeons, the researchers found that patients of high-volume surgeons experienced fewer surgical complications, such as dislocation and infection.<sup>100</sup> Another study, performed in 2016, also noted that patients were electing to have their hip arthroplasty procedures at high-volume hospitals (defined in this study as more than 400 procedures/year) and that these hospitals also



demonstrated lower complication rates.<sup>101</sup> Similar to knee arthroplasties, patient outcomes for hip arthroplasties are correlated with hospital and surgical volume.

## DIRECT MEASURES OF QUALITY: THE AMERICAN COLLEGE OF SURGEONS NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM

The surgical volume debate focuses on volume as a measure of quality of care. However, in the first part of this tasker, the Board concluded that “volume alone is not a good measure of quality and outcomes.”<sup>4</sup> This report elucidated the criticality of a standardized, data-driven-system to proactively address quality and safety concerns.<sup>4</sup> Further, “volume should never be used by an accrediting organization as a measure of quality,” says Dr. Mark Chassin, President of The Joint Commission. Each facility and surgeon is unique.<sup>4,102</sup>

While there is a robust body of literature supporting volume as a proxy for quality, other perspectives are more nuanced, taking into account risk-adjusted outcomes, along with surgeon and surgical team experience. These risk-adjusted outcome data, overlaid with quality improvement programs and peer reviews, do not require the use of indirect measures of quality, such as volume.<sup>15</sup> One such example is the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP). ACS NSQIP is a voluntary, “nationally validated, risk-adjusted, outcomes-based program to measure and improve quality of surgical care.”<sup>48</sup> The goal of NSQIP is to measure and improve the quality of surgical care and provide facility-based assessments of surgical outcomes.<sup>45,46</sup>

NSQIP is currently used in all 48 surgical inpatient MTFs.<sup>45,46</sup> However, NSQIP is not required in the purchased care system (TRICARE).<sup>49</sup> See Appendix C and D for more information.

### B3. TRICARE AND THE NATIONAL DEFENSE AUTHORIZATION ACT

TRICARE is the health care program serving 9.5 million Service members (Active and Guard/Reserve) on active duty (greater than 30 days); as well as retirees, their families, survivors, and certain former spouses around the world.<sup>103</sup> Benefits and plans vary depending on beneficiary category. The TRICARE plan structure has recently changed, based on legislative provisions annotated in Table 1 and Table 2. These changes include those related to TRICARE Prime and TRICARE Select programs. TRICARE Prime, as a managed care option, is offered near military bases.<sup>50</sup> All beneficiaries have Primary Care Managers (PCMs) who must make all specialty referrals.<sup>50</sup> If MTF care is not available; beneficiaries use network providers.<sup>50</sup> There are currently 4.8 million beneficiaries enrolled in TRICARE Prime, including all active duty Service members.<sup>50</sup> Enrolled family members do not require a co-payment.<sup>103</sup> TRICARE Select, as a preferred provider plan, allows beneficiaries to choose their TRICARE-authorized provider.<sup>50</sup> PCM referrals are not necessary and in most cases, a pre-authorization is not required.<sup>50</sup> There are currently 2 million beneficiaries enrolled in TRICARE Select.<sup>50</sup> There is a fixed co-payment of \$42 per visit (excluding well checks).<sup>103</sup>

Two regional contractors within the U.S. provide most health care services and support beyond what is available at military hospitals and clinics for all health plan options.<sup>103</sup> In each region, they manage provider networks, toll-free customer service call centers, enrollment, referrals,



authorization, claims processing, and beneficiary and provider education.<sup>103</sup> The West Region contractor is HealthNet Federal Services, LLC; the East Region contractor is Humana Military; and International SOS is the overseas contractor.<sup>103</sup> TRICARE for Life (TFL), as a Medicare-wraparound coverage for retired personnel, allows beneficiaries who have Medicare Parts A and B to receive supplemental insurance.<sup>50</sup> Medicare pays first and TRICARE pays second.<sup>50</sup> Beneficiaries do not have to use network providers.<sup>50</sup> There are currently 2.5 million beneficiaries enrolled in TRICARE Select.<sup>50</sup> There is an enrollment fee.<sup>50</sup> See Appendix C for more information on TRICARE.

“Processes to modify, update, or expand the TRICARE benefit are complex due to statutory and regulatory constraints.”<sup>55, p.5</sup> Congress may mandate changes to the MHS through the annual NDAAs legislation; the DoD must then interpret the statute, propose updates to regulatory guidance and administrative rules included in the Code of Federal Regulations, and acknowledge public commentary on the proposed change before implementation.<sup>55</sup> Once regulatory guidance is final, TRICARE manuals (*TRICARE Operations Manual [TOM]*), which govern the operations, policy, reimbursement, and systems of the Managed Care Support Contractors (MCSCs), must be updated as well as modification to the contracts.<sup>55</sup> Thus, “each step of this process is lengthy in its implementation, and the governmental, administrative, and contractual approvals needed to comply with the law delay substantive changes.”<sup>55, p.5</sup>

Table 1 and Table 2 provide the relevant sections from *National Defense Authorization Act for Fiscal Year 2017 (NDAA FY 2017)*<sup>52</sup> and *NDAA FY 2019*<sup>104</sup> specifically with regard to TRICARE and readiness updates addressed in this report. *NDAA FY 2018* did not provide relevant sections; thus, it is not included in this report.

**Table 1.** National Defense Authorization Act for Fiscal Year 2017 (NDAA FY 2017) Provisions<sup>52</sup>

NDAA FY 2017 Section	Summary
<b>Section 701. TRICARE Select and other TRICARE Reform</b>	<p>Not later than January 1, 2018, the Secretary of Defense shall establish a self-managed, preferred-provider network option under the TRICARE program. Such option shall be known as “TRICARE Select.”</p> <p>The Secretary shall establish TRICARE Select in all areas. Under TRICARE Select, eligible beneficiaries will not have restrictions to freedom of choice of the beneficiary with respect to health care providers.</p> <p>Not later than June 1, 2017, the Secretary of Defense shall submit to the Committees on Armed Services of the House of Representatives and the Senate an implementation plan to improve access to health care for TRICARE beneficiaries pursuant to the amendments made by this section.</p> <p>The plan under paragraph (1) shall—</p> <ul style="list-style-type: none"> <li>(A) ensure that at least 85 percent of the beneficiary population under TRICARE Select is covered by the network by January 1, 2018;</li> <li>(B) ensure access standards for appointments for health care that meet or exceed those of high-performing health care systems in the United States, as determined by the Secretary;</li> <li>(C) establish mechanisms for monitoring compliance with access standards;</li> <li>(D) establish health care provider-to-beneficiary ratios;</li> </ul>



NDAA FY 2017 Section	Summary
	<p>(E) monitor on a monthly basis complaints by beneficiaries with respect to network adequacy and the availability of health care providers;</p> <p>(F) establish requirements for mechanisms to monitor the responses to complaints by beneficiaries;</p> <p>(G) establish mechanisms to evaluate the quality metrics of the network providers established under section 728;</p> <p>(H) include any recommendations for legislative action the Secretary determines necessary to carry out the plan; and</p> <p>(I) include any other elements the Secretary determines appropriate.</p>
<p><b>Section 702.</b> <b>Reform of administration of Defense Health Agency and military medical treatment facilities</b></p>	<p>Beginning October 1, 2018, the Director of the Defense Health Agency shall be responsible for the administration of each military medical treatment facility, including with respect to—</p> <ol style="list-style-type: none"> <li>(1) Budgetary matters;</li> <li>(2) Information technology;</li> <li>(3) Health care administration and management;</li> <li>(4) Administrative policy and procedure;</li> <li>(5) Military medical construction; and</li> <li>(6) Any other matters the Secretary of Defense determines appropriate.</li> </ol> <p>The commander of each military medical treatment facility shall be responsible for—</p> <ol style="list-style-type: none"> <li>(1) Ensuring the readiness of the members of the armed forces and civilian employees at such facility; and</li> <li>(2) Furnishing the health care and medical treatment provided at such facility.</li> </ol> <p>In addition to the other duties of the Director of the Defense Health Agency, the Director shall coordinate with the Joint Staff Surgeon to ensure that the Director most effectively carries out the responsibilities of the Defense Health Agency as a combat support agency.</p>
<p><b>Section 704.</b> <b>Access to urgent and primary care under TRICARE program</b></p>	<p>The Secretary of Defense shall ensure that military medical treatment facilities, at locations the Secretary determines appropriate, provide urgent care services for members of the armed forces and covered beneficiaries until 11:00 p.m. each day.</p> <p>With respect to areas in which a military medical treatment facility covered by paragraph (1) is not located, the Secretary shall ensure that members of the armed forces and covered beneficiaries may access urgent care clinics through the health care provider network under the TRICARE program.</p> <p>The Secretary shall ensure that primary care clinics at military medical treatment facilities are available for members of the armed forces and covered beneficiaries between the hours determined appropriate under paragraph (2), including with respect to expanded hours described in subparagraph (B) of such paragraph.</p> <p>The Secretary shall determine the hours that each primary care clinic at a military medical treatment facility is available for members of the armed forces and covered beneficiaries based on—</p> <ol style="list-style-type: none"> <li>(i) the needs of the military medical treatment facility to meet the access standards under the TRICARE Prime program; and</li> <li>(ii) the primary care utilization patterns of members and covered beneficiaries at such military medical treatment facility.</li> </ol>
<p><b>Section 705.</b> <b>Value-based purchasing and acquisition of managed care support</b></p>	<p>The Secretary of Defense shall develop and implement value-based incentive programs as part of any contract awarded under chapter 55 of title 10, United States Code, for the provision of health care services to covered beneficiaries to encourage health care providers under the TRICARE program (including physicians, hospitals, and other persons and facilities involved in providing such health care services) to improve the following:</p>



NDAA FY 2017 Section	Summary
<p><b>contracts for TRICARE program</b></p>	<p>(A) The quality of health care provided to covered beneficiaries under the TRICARE program.</p> <p>(B) The experience of covered beneficiaries in receiving health care under the TRICARE program.</p> <p>(C) The health of covered beneficiaries.</p> <p>In developing value-based incentive programs under paragraph (1), the Secretary shall –</p> <p>(i) link payments to health care providers under TRICARE program to improved performance with respect to quality, cost, and reducing the provision of inappropriate care;</p> <p>(ii) consider the characteristics of the population of covered beneficiaries affected by the value-based incentive program;</p> <p>(iii) consider how the value-based incentive program would affect the receipt of health care under the TRICARE program by such covered beneficiaries;</p> <p>(iv) establish or maintain an assurance that such covered beneficiaries will have timely access to health care during the operation of the value-based incentive program;</p> <p>(v) ensure that such covered beneficiaries do not incur any additional costs by reason of the value-based incentive program; and</p> <p>(vi) consider such other factors as the Secretary considers appropriate.</p> <p>With respect to a value-based incentive program developed and implemented under paragraph (1), the Secretary shall ensure that –</p> <p>(i) the size, scope, and duration of the value-based incentive program is reasonable in relation to the purpose of the value-based incentive program; and</p> <p>(ii) the value-based incentive program relies on the core quality performance metrics adopted pursuant to section 728.</p> <p>No later than January 1, 2018, the Secretary of Defense shall develop and implement a strategy to ensure that managed care support contracts under the TRICARE program entered into with private sector entities, other than overseas medical support contracts–</p> <p>(A) improve access to health care for covered beneficiaries;</p> <p>(B) improve health outcomes for covered beneficiaries;</p> <p>(C) improve the quality of health care received by covered beneficiaries;</p> <p>(D) enhance the experience of covered beneficiaries in receiving health care; and</p> <p>(E) lower per capita costs to the Department of Defense of health care provided to covered beneficiaries.</p> <p>In developing and implementing the strategy required by paragraph (1), the Secretary shall ensure that local, regional, and national health plans have an opportunity to participate in the competition for managed care support contracts under the TRICARE program.</p> <p>The strategy required by paragraph (1) shall provide for the following with respect to managed care support contracts under the TRICARE program:</p> <p>(A) The maximization of flexibility in the design and configuration of networks of individual and institutional health care providers, including a focus on the development of high-performing networks of health care providers.</p> <p>(B) The establishment of an integrated medical management system between military medical treatment facilities and health care providers in the private sector that, when appropriate, effectively coordinates and integrates health care across the continuum of care.</p> <p>(C) With respect to telehealth services—</p> <p>(i) the maximization of the use of such services to provide real-time interactive communications between patients and health care providers and remote patient monitoring; and</p>



NDAA FY 2017 Section	Summary
	<p>(ii) the use of standardized payment methods to reimburse health care providers for the provision of such services.</p> <p>(D) The use of value-based reimbursement methodologies, including through the use of value-based incentive programs under subsection (a), that transfer financial risk to health care providers and managed care support contractors.</p> <p>(E) The use of financial incentives for contractors and health care providers to receive an equitable share in the cost savings to the Department resulting from improvement in health outcomes for covered beneficiaries and the experience of covered beneficiaries in receiving health care.</p> <p>(F) The use of incentives that emphasize prevention and wellness for covered beneficiaries receiving health care services from private sector entities to seek such services from high-value health care providers.</p> <p>(G) The adoption of a streamlined process for enrollment of covered beneficiaries to receive health care and timely assignment of primary care managers to covered beneficiaries.</p> <p>(H) The elimination of the requirement for a referral to be authorized prior receiving specialty care services at a facility of the Department of Defense or through the TRICARE program.</p> <p>(I) The use of incentives to encourage covered beneficiaries to participate in medical and lifestyle intervention programs.</p> <p>In developing and implementing the strategy required by paragraph (1), the Secretary shall—</p> <p>(A) assess the unique characteristics of providing health care services in Alaska, Hawaii, and the territories and possessions of the United States, and in rural, remote, or isolated locations in the contiguous 48 States;</p> <p>(B) consider the various challenges inherent in developing robust networks of health care providers in those locations;</p> <p>(C) develop a provider reimbursement rate structure in those locations that ensures—</p> <p>(i) timely access of covered beneficiaries to health care services;</p> <p>(ii) the delivery of high-quality primary and specialty care;</p> <p>(iii) improvement in health outcomes for covered beneficiaries; and</p> <p>(iv) an enhanced experience of care for covered beneficiaries; and</p> <p>(D) ensure that managed care support contracts under the TRICARE program in those locations will—</p> <p>(i) establish individual and institutional provider networks that will provide timely access to care for covered beneficiaries, including pursuant to such networks relating to an Indian tribe or tribal organization that is party to the Alaska Native Health Compact with the Indian Health Service or has entered into a contract with the Indian Health Service to provide health care in rural Alaska or other locations in the United States; and</p> <p>(ii) deliver high-quality care, better health outcomes, and a better experience of care for covered beneficiaries.</p> <p>The term “high-performing networks of health care providers” means networks of health care providers that, in addition to such other requirements as the Secretary of Defense may specify for purposes of this section, do the following:</p> <p>(A) Deliver high quality health care as measured by leading health quality measurement organizations such as the National Committee for Quality Assurance and the Agency for Healthcare Research and Quality.</p> <p>(B) Achieve greater efficiency in the delivery of health care by identifying and implementing within such network improvement opportunities that guide patients through the entire continuum of care, thereby reducing variations in the delivery of health care and preventing medical errors and duplication of medical services.</p>



NDAA FY 2017 Section	Summary
	<ul style="list-style-type: none"> <li>(C) Improve population-based health outcomes by using a team approach to deliver case management, prevention, and wellness services to high-need and high-cost patients.</li> <li>(D) Focus on preventive care that emphasizes—                             <ul style="list-style-type: none"> <li>(i) early detection and timely treatment of disease;</li> <li>(ii) periodic health screenings; and</li> <li>(iii) education regarding healthy lifestyle behaviors.</li> </ul> </li> <li>(E) Coordinate and integrate health care across the continuum of care, connecting all aspects of the health care received by the patient, including the patient’s health care team.</li> <li>(F) Facilitate access to health care providers, including—                             <ul style="list-style-type: none"> <li>(i) after-hours care;</li> <li>(ii) urgent care; and</li> <li>(iii) through telehealth appointments, when appropriate.</li> </ul> </li> <li>(G) Encourage patients to participate in making health care decisions.</li> <li>(H) Use evidence-based treatment protocols that improve the consistency of health care and eliminate ineffective, wasteful health care practices.</li> </ul>
<p><b>Section 707. Joint Trauma System</b></p>	<p>No later than 180 days after the date of the enactment of this Act, the Secretary of Defense shall submit to the Committees on Armed Services of the House of Representatives and the Senate an implementation plan to establish a Joint Trauma System within the Defense Health Agency that promotes improved trauma care to members of the Armed Forces and other individuals who are eligible to be treated for trauma at a military medical treatment facilities.</p> <p>The Joint Trauma System shall include the following elements:</p> <ul style="list-style-type: none"> <li>(1) Serve as a reference body for all trauma care provided across the military health system;</li> <li>(2) Establish standards of care for trauma services provided at military medical treatment facilities;</li> <li>(3) Coordinate the translation of research from the centers of excellence of the Department of Defense into standards of clinical trauma care;</li> <li>(4) Coordinate the incorporation of lessons learned from trauma education and training partnerships pursuant to section 708 into clinical practice.</li> </ul>
<p><b>Section 708. Joint Trauma Education and Training Directorate</b></p>	<p>The Secretary of Defense shall establish a Joint Trauma Education and Training Directorate (in this section referred to as the “Directorate”) to ensure that the traumatologists of the Armed Forces maintain readiness and are able to be rapidly deployed for future armed conflicts.</p> <p>The Secretary may enter into partnerships with civilian academic medical centers and large metropolitan teaching hospitals that have level I civilian trauma centers to provide integrated combat trauma teams, including forward surgical teams, with maximum exposure to a high volume of patients with critical injuries.</p>
<p><b>Section 709. Standardized system for scheduling medical appointments at military treatment facilities</b></p>	<p>Not later than January 1, 2018, the Secretary of Defense shall implement a system for scheduling medical appointments at military treatment facilities that is standardized throughout the military health system to enable timely access to care for covered beneficiaries.</p> <p>The system implemented under paragraph (1) shall ensure that the appointment scheduling processes and procedures used within the military health system do not vary among military treatment facilities.</p>
<p><b>Section 717. Evaluation and treatment of veterans and civilians at</b></p>	<p>The Secretary of Defense shall authorize a veteran (in consultation with the Secretary of Veteran Affairs) or civilian to be evaluated and treated at a military treatment facility if the Secretary of Defense determines that—</p>



NDAA FY 2017 Section	Summary
<b>military treatment facilities</b>	<ul style="list-style-type: none"> <li>(1) The evaluation and treatment of the individual is necessary to attain the relevant mix and volume of medical casework required to maintain medical readiness skills and competencies of health care providers at the facility;</li> <li>(2) The health care providers at the facility have the competencies, skills, and abilities required to treat the individual; and</li> <li>(3) The facility has available space, equipment, and materials to treat the individual.</li> </ul>

The *NDAA FY 2017* directed additional patient-centered enhancements throughout the direct care system. Specifically, *Section 704 Access to urgent and primary care under TRICARE program*<sup>52</sup> “directed MTFs to further enhance access to urgent care by expanding operating hours in MTF Patient Centered Medical Homes (PCMHs) and by implementing additional MTF urgent care clinics (UCCs) at locations where sufficient patient demand existed and justify operating costs.”<sup>105,p.57</sup> Additionally, *Section 709 Standardized system of scheduling medical appointments at military treatment facilities*<sup>52</sup> “directed the MHS to implement standard appointing processes and procedures and to develop productivity standards on the expected number of patient encounters for each health care provider.”<sup>105, p.57</sup> According to *Section 701*, as part of the implementation plan to improve access to health care for TRICARE beneficiaries, the plan shall establish mechanisms to evaluate the quality metrics of network providers.<sup>52</sup> The *NDAA FY 2017* further addresses the need for TRICARE to improve performance with respect to quality, cost, and reducing the provision of inappropriate care, per *Section 705*.<sup>52</sup>

**Table 2.** National Defense Authorization Act for Fiscal Year 2019 (NDAA FY 2019) Provisions<sup>104</sup>

NDAA FY 2019 Section	Summary
<b>Section 714. Streamlining of TRICARE Prime Beneficiary Referral Process</b>	<p>The Secretary of Defense shall streamline the process under section 1095f of title 10, United States Code, by which beneficiaries enrolled in TRICARE Prime are referred to the civilian provider network for inpatient or outpatient care under the TRICARE program.</p> <p>In carrying out the requirement in subsection (a), the Secretary shall meet the following objectives:</p> <ul style="list-style-type: none"> <li>(1) The referral process shall model best industry practices for referrals from primary care managers to specialty care providers.</li> <li>(2) The process shall limit administrative requirements for enrolled beneficiaries.</li> <li>(3) Beneficiary preferences for communicated relating to appointment referrals using state-of-the-art information technology shall be used to expedite the process.</li> <li>(4) There shall be effective and efficient processes to determine the availability of appointments at military medical treatment facilities, and when unavailable, to make prompt referrals to network providers under the TRICARE program.</li> </ul>
<b>Section 737. Comptroller General of the United States Review of Defense Health Agency Oversight of Transition</b>	<p>The Comptroller General of the United States shall provide to the Committees on Armed Services of the Senate and the House of Representatives a briefing and a report on a review by the Comptroller General of the oversight conducted by the Defense Health Agency with respect to the current transition between managed care support contractors for the TRICARE program. The briefing shall be provided by not later than July 1, 2019.</p> <p>The briefing and report under paragraph (1) shall each include the following:</p> <ul style="list-style-type: none"> <li>(A) A description and assessment of the extent to which the Defense Health Agency provided guidance and oversight to the outgoing and incoming managed care support</li> </ul>



NDAA FY 2019 Section	Summary
<p><b>Between Managed Care Support Contractors for the TRICARE Program</b></p>	<p>contractors for the TRICARE program during the transition described in paragraph (1) and before the start of health care delivery by the incoming contractor.</p> <p>(B) A description and assessment of any issues with health care delivery under the TRICARE program as a result of or in connection with the transition, and, with respect to such issues—</p> <ul style="list-style-type: none"> <li>(i) the effect, if any, of the guidance and oversight provided by the Defense Health Agency during the transition on such issues; and</li> <li>(ii) the solutions developed by the Defense Health Agency for remediating any deficiencies in managed care support for the TRICARE program in connection with such issues.</li> </ul> <p>(C) A description and assessment of the extent to which the Defense Health Agency has reviewed any lessons learned from past transitions between managed care support contractors for the TRICARE program, and incorporated such lessons into the transition.</p> <p>(D) A review of the Department of Defense briefing provided in accordance with the provisions of the Report of the Committee on Armed Services of the House of Representatives to Accompany H.R. 5515 (115th Congress; House Report 115-676) on TRICARE Managed Care Support Contractor Reporting.</p>

**B.4 SUMMARY OF *LOW-VOLUME HIGH-RISK SURGICAL PROCEDURES: SURGICAL VOLUME AND ITS RELATIONSHIP TO PATIENT SAFETY AND QUALITY OF CARE***

The first six-month report for this tasking produced several findings and recommendations targeting improved patient safety and quality of care for patients within the MHS. This secondary report further addresses improved patient safety and quality of care for patients in the purchased health care environment (TRICARE). The foundational themes that emerged from the previous report for which the findings and recommendations were based on, are as follows:

- (1) A culture of safety and quality is vital for building and sustaining infrastructure that provides safe and high-quality care. A sole focus on volume alone is not adequate to address patient safety or the quality of care and outcomes; there must be a standardized system in place to continuously monitor and proactively address quality and safety concerns in a transparent, non-punitive, data-driven learning environment across the DoD. Further, the surgical team and organizational infrastructure, not only the surgeon, must be viewed as a system whose integrated operation is essential for strengthening safety and quality.
- (2) Data capture, optimization, and outcome measurements for quality of care, patient safety, and transparency efforts are essential to deliver safe and high-quality care to active duty personnel, military retirees, and their beneficiaries. The MHS must ensure appropriate IT infrastructure and analytics are available to support enterprise leaders, providers, and patients, and maximize participation in and develop standardized responses to risk-adjusted outcomes data, such as the ACS NSQIP, a benchmarked, clinical, risk-adjusted, outcomes-based program to measure and improve care across the surgical specialties.
- (3) A focus on the ready medical force is an imperative through utilization of the KSAs, surgical simulation training, and military-civilian partnerships for peacetime and wartime care. The value of trauma experience and the integration of the entire surgical team are critical elements of success. Simulation training should be used to foster surgical team



training and prepare teams for deployment operations. These models should be broadened and applied to other areas of surgical performance throughout the MHS.

- (4) There are standardization opportunities across the Services and at the DHA-level, spurred by the *NDAA FY 2017 Section 702*, which states that as of 1 October 2018, the Director of the DHA shall be responsible for the administration and management of the military medical treatment facilities (MTFs). Successful practices and policies, such as already established through civilian and VA partnerships to increase both surgeon and surgical team proficiency, simulation training, and infrastructure requirements, should be leveraged.

For the Second Report of the tasking, the Board broadened its focus to look at surgical care provided in the purchased care network and identified opportunities to effectively assure these themes were applied and standardized across the MHS in a singular program of quality and safety, as described throughout this report. See Attachment One for the Executive Summary including Findings and Recommendations of Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*.<sup>4</sup>

## B.5 UPDATES TO FIRST REPORT: CONTRIBUTIONS TO MILITARY MEDICAL READINESS

The following section addresses areas discussed in greater detail in the first part of this tasking with updated information since publication of that report (November 2018). See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> for more information.

### THE JOINT TRAUMA SYSTEM

The first report provided an overview of the Joint Trauma System's (JTS) Joint Trauma Readiness Training Program as it relates to *NDAA FY 2017 Section 707 Joint Trauma System* and *Section 708 Joint Trauma Education and Training Directorate (JTET)*.<sup>4,52</sup> This section provides an update on JTS efforts since publication of the first report. There are two statutes that have driven change in the JTS. *NDAA FY 2017 Section 707* states that the JTS will be established within the DHA to "promote improved trauma care to members of the Armed Forces and other individuals who are eligible to be treated for trauma at a MTF."<sup>52</sup> Further, *Section 707* delineates JTS functions, as a reference body for all MHS trauma care, establishing standards of care for trauma services, and coordinating the translation of research and the incorporation of lessons learned from trauma education and training partnerships pursuant to *Section 708* into clinical practice.<sup>52,106</sup> *Section 708* states that the Secretary of Defense shall establish a JTET directorate and enter into partnerships with civilian medical facilities, establish goals of such partnerships, establish metrics, develop methods of data collection, develop quality of care outcome measures, communicate and coordinate lessons learned, develop standardized combat casualty care instruction, develop a comprehensive trauma registry, and direct the conduct of research.<sup>52,106</sup>

The JTS's mission is "to improve trauma readiness and outcomes through evidence-driven performance improvement."<sup>106</sup> It is composed of six directorates: (1) Department of Defense



Trauma Registry (DoDTR) Management, (2) Defense Committee on Trauma, (3) Performance Improvement, (4) Combatant Command (CCMD) Trauma System Operations, (5) JTET, which was established on March 31, 2019, and (6) Publications.<sup>106</sup> The Defense Medical Readiness Training Institute (DMRTI), currently under DHA J-7 (Education and Training), will transition under JTS in the summer of 2019.<sup>106</sup>

The JTET is focused on standardization of tactical combat casualty care (TCCC) curricula, which is currently underway.<sup>106</sup> TCCC training standardization is anticipated to be completed by the end of calendar year (CY) 2019.<sup>106</sup> Additional standardized trauma training courses will be developed to address the full spectrum of point-of-injury care through definitive care.<sup>106</sup>

## THE KNOWLEDGE, SKILLS, AND ABILITIES PROGRAM

One of the objectives of the first part of the TOR was to “examine the contribution of Knowledge, Skills, and Abilities (KSAs) of low-volume high-risk procedures to military medical readiness (i.e. surgeons, operating room staff).”<sup>4</sup> In 2017, the National Capital Region-Medical Directorate (NCR-MD) and Uniformed Services University of the Health Sciences (USUHS) led the KSA initiative to develop a methodology to measure the readiness of the MHS medical force.<sup>4,107</sup> The KSAs meet *NDAA FY 2017 Section 708’s* requirement to “establish metrics for measuring partnership performance.”<sup>106</sup> Furthermore, through the Military Health System Strategic Partnership with the American College of Surgeons (MHSSPACS), the KSAs, a quality manual, and a centralized partnership process are currently underway between the JTET, USUHS, and the ACS with the aim to have complete standardization in one to two years.<sup>106</sup>

KSAs shift the military medical model. Currently, the model is work component-based and emphasizes relative value units (RVUs) (i.e. productivity); KSAs, as readiness-based metrics included in the Quadruple Aim Performance Plan (QPP), help to recapture high value cases, expand partnerships, and improve coding and documentation through a force function.<sup>62</sup> Initiated in 2016 with an Accreditation Council for Graduate Medical Education (ACGME)-based methodology, a Tri-Service team developed eight critical wartime specialties, with approximately 3,790 KSAs.<sup>62</sup> Eight additional KSAs are expected to be implemented in June 2019 including ophthalmology, oral and maxillofacial surgery, cardiothoracic (CT) surgery, plastic surgery, urology, vascular surgery, otorhinolaryngology, and neurosurgery, as shown in Figure 2.<sup>62</sup>



**Figure 2.** Combat Casualty Care (CCC) KSA Specialties<sup>62</sup>

Core Combat Casualty Care (CCC) Team		Combat Casualty Care (CCC) Team + Specialties (start June 2019)	
1	General Surgery (including Colorectal)	9	Ophthalmology
2	Orthopedic Surgery	10	Cardiothoracic (CT) Surgery
3	Critical Care	11	Oral and Maxillofacial Surgery
4	Emergency Medicine	12	Plastic Surgery
5	Anesthesiology (including Certified Registered Nurse Anesthetist)	13	Urology
6	Emergency Room Nursing	14	Vascular Surgery
7	Critical Care Nursing	15	Otorhinolaryngology (ENT)
8	Trauma Surgery	16	Neurosurgery

Mapping KSAs to peacetime workload yields a KSA score (readiness indicator).<sup>62</sup> In particular, KSAs provide an opportunity to measure a surgeons’ skills related to the 10 “low-volume high-risk” surgical procedures.<sup>62</sup> Further, while none of the 10 surgical procedures are emergent, the KSAs push general surgeons to practice a reasonable scope of both emergent and elective surgeries.<sup>62</sup> Moreover, KSAs can be leveraged to look at non-trauma surgery in a more robust way and, to a certain extent, trauma skills are the same skills used in elective procedures.<sup>62</sup> For example, the KSAs for trauma prepare general surgeons to rescue a patient in any type of surgery.<sup>62</sup>

Methodological updates to both General Surgery and Orthopedic Surgery have led to greater accuracy for the metric and changes to results for the National Capital Region-Medical Directorate (NCR-MD).<sup>62</sup> This includes addressing deployment tempo for General Surgery incorporating the results of the Orthopedic Surgery KSA Community Assessment.<sup>62</sup> Results indicate that the NCR-MD has 16% of General Surgeons meeting the KSA threshold, with 72% of Orthopedic Surgeons meeting the new threshold of 35,000.<sup>62</sup> Fort Belvoir Community Hospital (FBCH) and Walter Reed National Military Medical Center (WRNMMC) collectively captured 39% of the total KSA points available in the market for General Surgery.<sup>62</sup> Orthopedics is currently capturing 37% of the total KSA points available in the market.<sup>62</sup> Furthermore, surgical optimization effort to recapture KSA cases, expand to include VA and cancer care, and partner locally to embed surgeons are underway.<sup>62</sup> While incremental progress has been made in all three, synchronization of efforts is needed to realize the goals. Additionally, KSA metrics for Emergency Medicine and Critical Care have been finalized with Trauma Surgery to be completed in the near future.<sup>62</sup>

## GRADUATE MEDICAL EDUCATION

Military Graduate Medical Education (GME) programs are essential to support readiness.<sup>108</sup> While there are few military surgical residency programs currently, they are often top performers compared to civilian programs.<sup>108</sup> A 2019 study evaluated American Board of Surgery (ABS)



Exam scores across surgical residency programs over 15 years.<sup>109</sup> Programs in the first decile (rank 1 to rank 23) had more military and academic programs, whereas a majority of tenth decile programs were community programs.<sup>109</sup> Of the 231 programs that were included in the analysis, eight were military residency programs, with three of the eight in the first decile—Madigan Army Medical Center ranking first, San Antonio Military Medical Center ranking third, and the National Capital Consortium ranking twenty-third overall.<sup>109</sup> Moreover, there were more military programs in the first decile cohort and none in the tenth decile cohort.<sup>109</sup> The DoD is often a leader for the entire medical community in providing lessons-learned due to its transformative medical research and practices, including in the areas of infectious disease and trauma.<sup>108</sup>

## PARTNERSHIPS

The MHS approaches partnerships from multiple levels, including at the strategic level, through the MHSSPACS, at the operational level, through educational partnership agreements (EPAs) and Service-specific agreements, and at the tactical level, through local MTF agreements.<sup>63</sup>

At the operational level, the DHA has prioritized its systematic approach to establishing and maintaining partnerships in its strategic map and is working on a JTS pilot program to improve surgical proficiency and readiness.<sup>63</sup> As part of the strategic map, one of the three means (M) to execute the DHA mission, is for the J-9 Directorate (Research and Development Directorate) to “enhance value through partnerships” (M2).<sup>64,110</sup> M2 aims to: “Operationally define strategic partnerships/alliances within current and future contexts; coordinate with the stakeholders to prioritize, update, and maintain portfolio of MHS’ strategic partnerships required for mission effectiveness (e.g., academic affiliations, training augmentation for readiness, extramural research, best practice identification, etc.); and use strategic partnerships to achieve value.”<sup>111, p.2</sup> The DHA J-9 Directorate, as a federal laboratory, has authority to establish partnerships under *Title 10 of United States Code Section 2194*, which states, “The Secretary of Defense shall authorize the director of each defense laboratory to enter into one or more education partnership agreements with educational institutions in the United States for the purpose of encouraging and enhancing study in scientific disciplines at all levels of education.”<sup>64,112</sup> The DHA’s current Strategic Partnerships or Alliances include the VA, the Department of Health and Human Services (HHS), and the ACS.<sup>64</sup>

In January 2018, the DHA J-9 Directorate established an EPA with the University of Texas Health System (UT), which includes eight universities and six health systems.<sup>65</sup> Part of this EPA includes the DHA M2 Pilot—JTS/UT Appendix C: Trauma Team Training to Support Operational Readiness KSAs. As discussed above, the JTET is also required under *NDAA FY 2017* to establish metrics for measuring partnership performance.<sup>52,106</sup> The KSAs will be implemented to support this requirement as the primary performance metric.<sup>106</sup> The JTS drives the content of the agreement, while the DHA J-9 Directorate administratively organizes and staffs the agreement framework.<sup>64</sup> The purpose of the JTS/UT Pilot is to provide as much of a template as possible to develop a standardized EPA framework available for use for surgical training and readiness.<sup>64</sup>



The DHA J-9 Directorate is continuing to evaluate its partnership methodology throughout the lifecycle and to raise any concerns, including licensure, liability, and scope of practice issues.<sup>64</sup> EPAs do not involve the exchange of appropriated funds.<sup>64</sup> As mentioned in the first report of this tasking, the Services and many MTFs have established agreements for surgical training, proficiency, and readiness.<sup>4</sup> The EPA does not necessarily replace local agreements, but could provide a standardized framework for sustainment, mitigating the risk of transient personnel, such as an attorney leaving an MTF and the next attorney not agreeing with the local partnership.<sup>64</sup> The EPA approach, with projects placed in separate appendices, means that the JTS/UT Pilot can be built upon, if parties agree.<sup>64</sup> Overall, the JTS/UT Pilot provides an opportunity to review and enhance the templated, DHA-level partnership approach to improve readiness, including an added focus on KSAs, and to develop lessons-learned.

At the enterprise level, *NDAA FY 2017 Section 717* allows a veteran or civilian to be evaluated and treated at an MTF if:

- (1) The evaluation and treatment of the individual is necessary to attain the relevant mix and volume of medical casework required to maintain medical readiness skills and competencies of health care providers at the facility;
- (2) The health care providers at the facility have the competencies, skills, and abilities required to treat the individual; and
- (3) The facility has available space, equipment, and materials to treat the individual.<sup>52</sup>

Further, partnerships with the VA through the VA Maintaining Internal Systems and Strengthening Integrated Outside Networks (MISSION) Act, provide opportunities to improve surgical proficiency and overall readiness.<sup>108,113</sup> For example, there are many VA patients with head and neck trauma—an injury that is directly linked to battlefield readiness.<sup>108</sup> In turn, there are gaps in the VA's ability to provide certain types of surgical care that the DoD could help fill. For example, the Washington, DC VA currently has a gap in vascular surgery.<sup>108</sup> Successful VA/DoD partnerships already exist, such as the partnership in San Antonio, Texas, which also partners with civilian systems.<sup>108</sup>

## B.6 OBSERVATIONS

The following observations are made for section B.5, as TRICARE is discussed in greater detail in Appendix C and the high-acuity surgical operations issue in Appendix D.

- (1) *NDAA FY 2017 Sections 701 and 705* address establishing mechanisms to evaluate quality metrics of TRICARE network providers (*Section 701*), linking payments of TRICARE providers to performance improvement (*Section 705*), and developing provider reimbursement that ensures improvement in health outcomes (*Section 705*).
- (2) The KSA initiative continues to expand and provide opportunities for addressing skill sustainment by providing a readiness indicator. Further, the KSAs allow surgeons to practice a reasonable scope of both emergent and elective surgeries for maintenance of skills across surgical procedures.
- (3) The VA MISSION Act creates an opportunity for strengthening partnerships and collaboration between the VA and the DoD through transfer of VA patients to the MHS.



The DoD/VA partnership in San Antonio, Texas may provide an example of the model to be adopted throughout the MHS.

- (4) The DHA, through its increased focus on EPAs, provides an opportunity to template systematic and sustained partnership agreements at the enterprise level. The JTS-University of Texas Pilot provides an example of templating EPAs as possible to develop standardized partnerships for surgical training and readiness.



## APPENDIX C. TRICARE PURCHASED CARE QUALITY OF CARE

### C.1 INTRODUCTION

Appendix C addresses the following objective in the Terms of Reference (TOR): Review the array of low-volume high-risk surgical procedures performed on Military Health System (MHS) beneficiaries in the purchased care system (TRICARE). The appendix's focus on quality is built on the same foundational theme of the first part of this taking which states: "A sole focus on volume alone is not adequate to address patient safety or the quality of care and outcomes; there must be a standardized system in place to continuously monitor and proactively address quality and safety concerns in a non-punitive, data-driven environment."<sup>4, p.1</sup> Thus, in addition to providing volume data, this appendix elucidates purchased care quality and safety efforts, including clinical quality policy and processes.

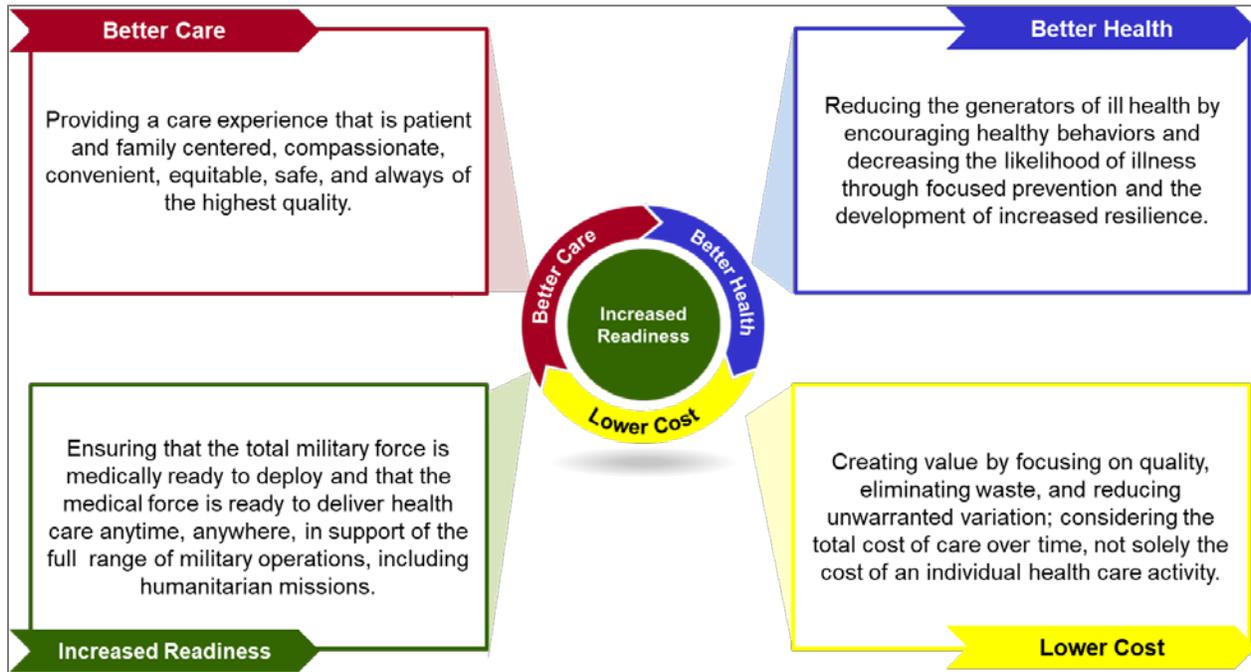
The MHS is one of the largest and most complex health systems in the U.S., delivering health care services to 9.5 million beneficiaries, including 1.4 million active duty and 331,000 reserve-component personnel in nearly 700 military facilities and additional civilian facilities through TRICARE health plans.<sup>5,114</sup> As the Department of Defense's (DoD) health care program, TRICARE provides care to Service members (Active Duty) and Guard/Reserve (on Active Duty greater than 30 days) and their families, retirees and their families, survivors, and certain former spouses.<sup>105</sup> The purchased care system, provided through health plans and contracts with civilian providers and facilities worldwide, is an essential element in ensuring the health care benefit: "The DoD relies on the MHS to provide a ready medical and medically ready force. The MHS maintains integrated medical teams to deliver health services in support of America's military—anytime, anywhere."<sup>105, p.2</sup>

### C.2 BACKGROUND

The MHS is a large, complex health system, covering both direct care and purchased care across all of the Services. With the DHA's assumption of responsibilities for the administration and management of all MTFs in accordance with *National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2017 Section 702*,<sup>52</sup> a coordinated, phased approach, with standardized best practices, is necessary. Thus, the MHS Quadruple Aim Performance Plan (QPP) (Figure 1) will be used to provide the strategic framework to align the priorities of the Army, Navy, Air Force, and Defense Health Agency (DHA).<sup>105</sup> The QPP guides the DoD to increase readiness, and deliver better care, better health, and lower cost.<sup>105</sup> The QPP translates strategy to action and aims to fully integrate a system of health and readiness.<sup>115</sup>



Figure 3. MHS Quadruple Aim Performance Process (QPP)<sup>115</sup>



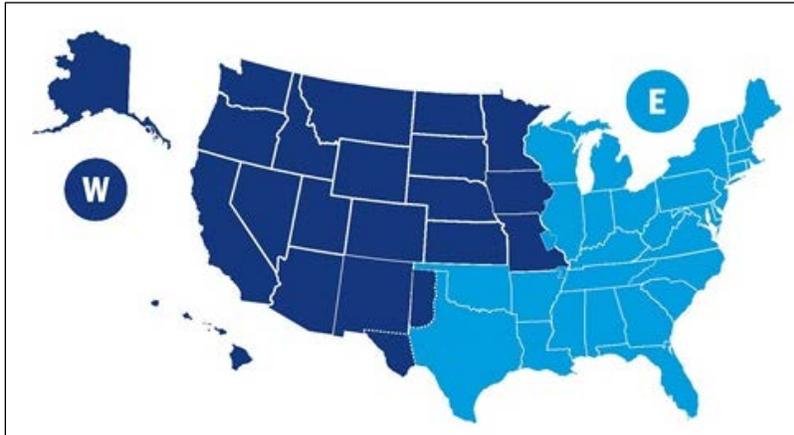
To meet the requirements of *NDA FY 2017 Section 702*,<sup>52</sup> the DoD plans to transform the MHS through five lines of effort: (1) a clear, measurable definition of medical readiness for which the health system is responsible for delivering is necessary (includes the Knowledge, Skills, and Abilities [KSA] initiative discussed in Appendix B); (2) optimize MTFs as training platforms for the ready medical force; (3) plans for centralization of health care administration to focus on standardization of health care delivery and readiness support; (4) improvement of patient experience so that each MTF is the first choice for beneficiaries where available and appropriate; and (5) the DHA to modernize the TRICARE health plan.<sup>114</sup> As a result, two comprehensive options are now offered: a managed care plan (TRICARE Prime) and a preferred provider network (TRICARE Select).<sup>114</sup> Additionally, “a strategy for value in development rewards quality, safety, experience, and outcomes rather than volume and intensity through value-based pilots and demonstration projects that target savings and value creation through patient-defined and clinical outcomes.”<sup>114</sup>



## OVERVIEW OF THE TRICARE HEALTH PROGRAM

“The TRICARE health plan provides care to all members of the Uniformed Services, their families, and retirees, rendering TRICARE the fourth largest health plan in the U.S.<sup>114</sup> The aim

**Figure 4.** Two TRICARE Regions in the United States



is to provide access to the full range of high-quality health care services while preserving the capability to support military operations.<sup>105</sup> TRICARE purchased care is divided into three regions—two regions in the U.S. and one region overseas (anywhere outside of the U.S. is considered overseas). The two U.S. regions have their own regional contractors: Health Net Federal Services, LLC for

the West Region and Humana Military for the East Region, as shown in Figure 4.<sup>103</sup> As of January 1, 2018, TRICARE North and South were combined to form TRICARE East, while TRICARE West remained mostly unchanged.<sup>105</sup> TRICARE provides comprehensive coverage to all beneficiaries, including health plans, special programs (supplemental programs tailored specifically to beneficiary health concerns or conditions), prescriptions, and dental plans.<sup>103,116</sup> The DHA, under the leadership of the Assistant Secretary of Defense (Health Affairs), manages TRICARE.<sup>103</sup>

In addition to services at MTFs, TRICARE offers beneficiaries several health plans based on the following options:

- **TRICARE Prime®** is comparable to health maintenance organization (HMO) benefits. Each enrollee chooses or is assigned a primary care manager (PCM), who is a health care professional responsible for assisting the patient with management of his/her care, promoting preventive health services, and arranging for specialty provider services. Access standards for TRICARE Prime apply to the travel time to reach a primary care or specialty care provider, as well as the waiting times to get an appointment and in doctors' offices. The TRICARE Prime point-of-service (POS) option allows enrollees to acquire care from TRICARE-authorized providers other than the assigned PCM without a referral; however, there may be deductibles and cost shares significantly higher than those under TRICARE Standard.<sup>105</sup> There are currently 4.8 million beneficiaries enrolled in TRICARE Prime.<sup>50</sup>
- **TRICARE Select®** is a self-managed, fee-for-service plan that replaced TRICARE Standard and Extra effective January 1, 2018.<sup>103,117</sup> There are currently 2 million beneficiaries enrolled in TRICARE Select.<sup>50</sup>
- **TRICARE for Life (TFL)** is Medicare wraparound coverage for TRICARE-eligible beneficiaries who have Medicare as their primary health care coverage. With TFL, in most



instances, Medicare pays first, then TRICARE pays second.<sup>105</sup> There are currently 2.5 million beneficiaries enrolled in TFL.<sup>50</sup>

- **Other plans and programs:** Some beneficiaries may qualify for other benefit options depending on their location, Active/Reserve status, and/or other factors, such as the premium-based health plan TRICARE Young Adult (TYA), available for purchase by qualified dependents up to the age of 26.<sup>105</sup>

An additional TRICARE Prime option is the Uniformed Services Family Health Plan (USFHP) available through networks of community-based, not-for-profit care systems in six areas of the United States.<sup>118</sup> To enroll in the USFHP, the beneficiary must live in one of the six designated service areas, shown in Table 3.<sup>118</sup> Beneficiaries within this plan receive all care from a primary care provider that they select from the network of private physicians affiliated with one of the not-for-profit health care systems (Table 3).<sup>118</sup> Enrollees in the USFHP do not receive care at MTFs or from TRICARE network providers.<sup>118</sup> The USFHP is managed through a separate contract.

**Table 3.** Uniformed Services Family Health Plans and Service Areas<sup>118</sup>

Designated Provider	Uniformed Services Family Health Plan Service Area
<b>Johns Hopkins Medicine</b>	<ul style="list-style-type: none"> <li>• Maryland</li> <li>• Washington D.C.</li> <li>• Parts of Pennsylvania, Virginia, Delaware, and West Virginia</li> </ul>
<b>Martin’s Point Health Care</b>	<ul style="list-style-type: none"> <li>• Maine</li> <li>• New Hampshire</li> <li>• Vermont</li> <li>• Upstate and Western New York</li> <li>• Northern Tier of Pennsylvania</li> </ul>
<b>Brighton Marine Health Center</b>	<ul style="list-style-type: none"> <li>• Massachusetts, including Cape Cod</li> <li>• Rhode Island</li> <li>• Northern Connecticut</li> </ul>
<b>St. Vincent Catholic Medical Centers</b>	<ul style="list-style-type: none"> <li>• New York City</li> <li>• Long Island</li> <li>• Southern Connecticut</li> <li>• New Jersey</li> <li>• Philadelphia and area suburbs</li> </ul>
<b>CHRISTUS Health</b>	<ul style="list-style-type: none"> <li>• Southern Texas</li> <li>• Southwest Louisiana</li> </ul>
<b>Pacific Medical Centers</b>	<ul style="list-style-type: none"> <li>• Puget Sound area of Washington state</li> </ul>

“Processes to modify, update, or expand the TRICARE benefit are complex due to statutory and regulatory constraints.”<sup>55, p.5</sup> Congress may mandate changes to the MHS through the annual NDAA legislation, then the DoD must interpret the statute, propose updates to regulatory guidance and administrative rules included in the Code of Federal Regulations, and acknowledge public commentary on the proposed change before implementation.<sup>55</sup> Once regulatory guidance is final, TRICARE manuals (*TRICARE Operations Manual [TOM]*), which govern the



operations, policy, reimbursement, and systems of the Managed Care Support Contractors (MCSCs), must be updated as well as modification to the contracts.<sup>55</sup> Thus, “each step of this process is lengthy in its implementation, and the governmental, administrative, and contractual approvals needed to comply with the law delay substantive changes.”<sup>55, p.5</sup>

### C.3 TRICARE QUALITY OF CARE

The *TOM* is the primary vehicle for providing operational guidelines and instructions to the contractor and is incorporated into the MCSCs.<sup>54</sup> “The *TOM* provides a mechanism for clarifying and modifying existing contractual requirements, adding new specifications/requirements, and deleting obsolete information. All or portions of the *TOM* may also be incorporated by reference into other TRICARE contracts.”<sup>54</sup> At this time, the most recent edition is *TOM 6010.59-M* from April 1, 2015, with chapter revisions noted where applicable.<sup>54</sup>

The *TOM 6010.59-M Chapter 7 Section 4, Clinical Quality Management Program (CQMP)*, revised May 30, 2018, states that the MCSCs, USFHP contractors, and the TRICARE Overseas Program (TOP) contractor (all of which are hereafter referred to as the contractor):

“Shall operate a CQMP which results in demonstrable quality improvement in the quality of health care provided beneficiaries, and in the process and services delivered by the contractor. The CQMP is defined as the integrated processes, both clinical and administrative, that provide the framework for the contractor to objectively define and measure the quality of care received by beneficiaries. This CQMP shall demonstrate how the contractor’s goals and objectives, leadership, structure, and operational components are designed to achieve the efficient and effective provision of timely access to high quality health care. As part of the CQMP, the contractor shall develop a CQMP Plan with goals and objectives followed by a CQMP Annual Report describing the results of the quality activities performed during each program year.”<sup>54</sup>

The CQMP includes quality improvement initiatives and projects, potential quality issue (PQI) investigations; accreditation; oversight of patient safety; and the peer review organization committee.<sup>49</sup> All MCSCs are required to follow the *TOM* and have a clinical quality program.<sup>49</sup> The MCSCs are able to apply their own “best practices” and approaches within the CQMP; however, quality of care must be the same across facilities and for all beneficiaries.<sup>49</sup>

As part of the CQMP Annual Report, a contract requirement is that the contractors conduct quality studies and quality improvement projects.<sup>49</sup> The contractors identify topics to meet case management requirements identified for the Utilization Review Accreditation Commission (URAC).<sup>49</sup> URAC is an independent, nonprofit accreditation entity, founded in 1990 as a health care quality validator.<sup>119</sup> URAC’s Health Plan Accreditation focuses on promoting patient safety across the continuum of care through quality improvement activities.<sup>120</sup> The MCSCs, in collaboration with the DHA clinical quality nurse consultants, identify topics targeting population health quality of care and outcomes, such as Healthcare Effectiveness Data and Information Set (HEDIS) measures.<sup>49</sup>



Additionally, TRICARE contracted facilities must be accredited by independent bodies, such as the Joint Commission or the Commission on Accreditation of Rehabilitation Facilities.<sup>50</sup> There are no standard mechanisms for TRICARE to conduct routine site visits for network providers; however, if there is evidence of adverse events, a site visit can be conducted.<sup>50</sup>

As the DHA assumes administration and management responsibility for MTFs per *NDAA FY 2017 Section 702*,<sup>52</sup> clinical quality care revisions continue within the purchased care network. Specifically, the newly created DHA Policy and Integration Division is revising and developing policy that focuses on aligning direct care (care received at MTFs) with purchased care (care received in the TRICARE network outside of an MTF).<sup>49</sup> These quality-focused, standardization opportunities are essential in ensuring patient safety and for providing high-quality health care services to all beneficiaries across the enterprise, regardless of where care is received.

As discussed in Appendix B, the *NDAA FY 2017 Section 701* established TRICARE Select, a new preferred provider network health plan, among several other changes to the TRICARE program.<sup>52</sup> As part of this requirement, DoD was required to develop an implementation plan for TRICARE Select that addressed seven mandated elements:

- (A) Ensure that at least 85 percent of the TRICARE Select beneficiary population is covered by the network by January 1, 2018;
- (B) Ensure access standards for health care appointments;
- (C) Establish mechanisms for monitoring compliance with standards for access to care;
- (D) Establish health care provider-to-beneficiary ratios;
- (E) Monitor complaints by beneficiaries with respect to network adequacy and health care provider availability on a monthly basis;
- (F) Establish requirements for mechanisms to monitor the responses to complaints by beneficiaries; and
- (G) Establish mechanisms to evaluate the quality metrics of the network providers.<sup>52,117</sup>

The U.S. Government Accountability Office (GAO) was charged to review the TRICARE implementation plan with findings published in GAO-18-358 *TRICARE Select Implementation Plan Included Mandated Elements, but Access Standards Should be Clarified* in April 2018. In addition to assessing the above seven elements, the GAO assessed the implementation plan against leading civilian practices.<sup>117</sup> The report found that many of the practices were incorporated, such as establishing goals, but some leading practices were only partially or not at all incorporated, such as plans to assess progress.<sup>117</sup>

The GAO report also found the TRICARE implementation plan had discrepancies between the *NDAA FY 2017* outline and the DoD's intended plan.<sup>117</sup> According to the GAO report, the *NDAA FY 2017* noted that "DoD will use the access standards for TRICARE Prime—a managed care option—for TRICARE Select. However, DoD officials told GAO that the contractors are responsible for developing their own access standards, which DoD must approve."<sup>117</sup> It was noted that the DoD was still developing its approach for this element which is why it was not included in the original plan.<sup>117</sup> The GAO report concluded, due to time constraints and competing priorities which impacted the DoD's ability to address all seven elements, that some requirements are being addressed by other oversight efforts.<sup>117</sup> Thus, it could not be determined



if the DoD is achieving its mission of ensuring the “right level of care, at the right time, delivered by the right provider.”<sup>117, p.12</sup>

In September 2018, the GAO submitted to Congress GAO-18-574 *Defense Healthcare Expanded Use of Quality Measures Could Enhance Oversight of Provider Performance* report.<sup>121</sup> Because of the lack of quality measures and performance standards in purchased care and the lack of standardization between direct and purchased care systems, the GAO recommended that the Office of the Assistant Secretary of Defense for Health Affairs (OASD[HA]) should direct those bodies to prioritize, as appropriate, the selection of measures that apply to both direct and purchased care at the provider level and expand the range of quality measure types and medical conditions that are assessed.<sup>49,121</sup> The report also recommended that as the MHS governing bodies conduct their recurring reviews of quality measures selected for the MHS’ core dashboard and purchased care dashboards (discussed below).<sup>121</sup>

There are currently three quality management/tracking projects planned to address these recommendations:

- (1) Aligning the direct and purchased care dashboards to increase the number of overlapping quality measures reported.
- (2) Quality management system centered on a value-based insurance design with the goal of selecting quality measures that will establish expectations for network providers and provide incentives for providers who exceed standards and set forth corrective actions for those not meeting minimal standards.
- (3) Implement Leapfrog Safety Grades and Leapfrog Survey throughout purchased care to improve provider oversight and public transparency.<sup>49</sup>

## IDENTIFICATION OF POTENTIAL QUALITY AND PATIENT SAFETY CONCERNS

According to the *TOM 6010.59-M Chapter 7 Section 4*, the contractor identifies, tracks, trends, and reports interventions to resolve potential quality issues (PQIs, defined as “clinical or system variance warranting further review and investigation for determination of the presence of an actual quality issue”) and quality issues (QIs, defined as “a verified deviation from acceptable standards of practice or standards of care as a result of some process, individual, or institutional component of the health care system”).<sup>54</sup> This is done using the most recent National Quality Forum Serious Reportable Events, CMS Hospital Acquired Conditions, Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators (PSIs), and any other DHA required indicators/events.<sup>54</sup>

Regarding patient safety or QI identification, the contractor applies medical judgement, evidence-based medicine, best medical practice, and follows the established TRICARE guidelines for the identification, evaluation, and reporting of all PQIs and QIs.<sup>54</sup> The contractors monitor and assess all medical records with PQIs in an ongoing basis.<sup>54</sup>

Patient outcomes in the purchased care system is largely monitored through PQIs.<sup>49</sup> External to the MCSCs, providers or beneficiaries may directly report an issue or concern; PQI referrals may also come from MTFs or internally from the DHA.<sup>49</sup> AHRQ’s PSI software is used to detect QIs



and monitor outcomes through algorithms that compare claims against each other looking for variance.<sup>49</sup> The vast majority of PQIs are identified through this algorithm and further investigation is done on outliers.<sup>49</sup>

Unlike the direct care side, which requires all inpatient MTFs to utilize the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) a “nationally validated, risk adjusted, outcomes-based program to measure and improve quality of surgical care,”<sup>48</sup> purchased care does not require network providers to use NSQIP.<sup>49</sup> In direct care, NSQIP allows for performance measurement and standardization across the system; however, since it is not a requirement in purchased care, not all providers participate or share data.<sup>49</sup>

The TRICARE Division of Clinical Operations and Policy previously performed clinical quality oversight; however, in December 2018, the Division underwent several reorganizations resulting in one centralized office—the DHA Policy and Integration Division.<sup>50</sup> Thus, the Division (i.e. the personnel overseeing quality) includes two medical director physicians (for TRICARE East and West) and one quality nurse consultant in the central office.<sup>50</sup> Two additional quality nurse consultants oversee clinical quality management activities of the six USFHP designated provider sites.<sup>49</sup> This one office is responsible for oversight of clinical quality for up to 9.5 million beneficiaries across two large, complex MCSCs, including six distinct USFHP designated providers, which has functionally required the staff to assume additional responsibilities with no additional personnel support, creating resourcing challenges.<sup>49</sup>

The DHA clinical quality management nurse consultants provide oversight for the MCSCs and designated providers, with each nurse consultant covering three designated providers.<sup>49</sup> The nurse consultants monitor and review all contract activities pertaining to these providers as well as review and enforce quality plans to ensure proper execution as specified in the contracts.<sup>49</sup> Additionally, the nurse consultant reviews all PQIs and adverse events, from initial report to all related follow-ups.<sup>49</sup> As a result, nurse consultants spend a majority of their time on patient safety as opposed to facility quality.<sup>49</sup> Because they are the main conduit between DHA and contractors, the nurse consultant attends all quality meetings to ensure that decisions are made in the best interests of DHA and that contract quality care and management stipulations are met.<sup>49</sup> Nurse consultants also collaborate closely with MTFs and direct care points of contact to ensure that the purchased and direct care systems are closely aligned.<sup>49</sup> Moreover, due to their limited numbers and significant responsibilities, nurse consultants spend a majority of their time on purchased care related policies, leaving limited time for contract management.<sup>49</sup>

## SERIOUS REPORTABLE EVENTS AND THE PEER REVIEW COMMITTEES

Peer review is another important component of the CQMP. All claims submitted for health services are subject to review for quality of care and appropriate utilization, under the Quality and Utilization Review Peer Review Organization program, which is primarily concerned with medical judgement regarding the quality and appropriateness of health care services.<sup>54</sup> Further, according to the *TOM 6010.59-M* all QIs shall be reviewed and confirmed by a peer review committee.<sup>54</sup> The peer review committee is composed of network providers and specialty providers as voting members, and quality Subject Matter Experts (SMEs) and TRICRAE Division of Clinical Operations and Policy Medical Directors as non-voting members.<sup>49</sup> Cases



that do not have a like-specialty provider on the peer review committee are sent to an independent review organization.<sup>49</sup>

The peer review committee determines “deviations from standards of care, severity levels, recommending interventions to include Corrective Action Plans (CAPs), reporting to licensure boards, and follow-up monitoring through resolution.”<sup>54</sup> The peer review committee is also responsible for raising patient safety concerns to the highest level.<sup>49</sup> All determinations regarding the standard of care are approved by the peer review committee.<sup>54</sup>

When the MCSC becomes aware of a serious reportable event (SRE), they must report it to the DHA Policy and Integration Division within two days of the event.<sup>49</sup> The CAP is assigned after all necessary records are reviewed; the case is considered closed after the CAP is complete or a self-imposed action plan is completed by the provider.<sup>49</sup> Moreover, the contracts are responsible for ensuring the CAP is implemented without direct oversight from the government clinical quality managers.<sup>49</sup> However, the managed care support contractor provides monthly quality intervention reports which are reviewed by the clinical quality management nurse consultants.<sup>49</sup> The clinical quality nurse consultants also ensure that the MCSC’s clinical quality activities are in accordance with the CQMP.<sup>49</sup>

#### C.4 SURGICAL VOLUME ISSUE WITHIN TRICARE: 10 “LOW-VOLUME HIGH-RISK” SURGICAL PROCEDURES

The following section addresses the 10 “low-volume high-risk” surgical procedures performed within the purchased care network. As shown in Table 4, across the purchased care network in 2018, 53,279 surgical procedures of the 10 “low-volume high-risk” surgical procedures were performed on MHS beneficiaries, including 230 provider areas across more than 2,000 facilities.<sup>56</sup> In 2017 in direct care, 5,537 of the 10 procedures were performed on beneficiaries at MTFs.<sup>122</sup> Similar patterns are found across the system in terms of the distribution of procedures performed, with knee replacements being the most performed surgical procedure of the 10 surgical procedures.

The data for the 10 procedures performed in the purchased care network only includes the number of procedures performed on MHS beneficiaries by TRICARE-authorized providers. The data in Table 4 does not include patients outside of the TRICARE network. Thus, while a facility may appear to conduct a low number of a specific procedure, this may not necessarily be the case due to the non-TRICARE beneficiaries receiving care at that facility. Because TRICARE patients make up only a portion of surgeon and facility cases, the volume of care by surgeon and facility is unknown. It is outside of the scope of this tasking to review the complete case-mix for these civilian facilities on non-TRICARE beneficiary care. Furthermore, since NSQIP is not a requirement in the MCSCs for TRICARE providers or facilities, the DHA does not have risk-adjusted outcome data for the surgical procedures performed in the purchased care network. See Attachment Three for the data by MTF-service area.



**Table 4.** Number of 10 “Low-Volume High-Risk” Surgical Procedures in the Purchased Care and Direct Care Networks<sup>56,122</sup>

	Procedure	Purchased Care Network (2018)	Direct Care Network (2017)
	Bariatric surgery	4,110	1,466
Cancer resections	Esophagus	451	46
	Lung	2,030	223
	Pancreas	699	66
	Rectum	2,807	177
Cardiovascular	Carotid arterial stenting	654	15
	Complex aortic surgery	485	184
	Mitral valve repair	1,273	42
Orthopedics	Hip replacement	14,833	1,211
	Knee replacement	25,937	2,107
	<b>Total</b>	<b>53,279</b>	<b>5,537</b>

A simple count of the number of procedures performed (i.e. volume) may not be the most effective practice to ensure quality of care for TRICARE beneficiaries. During data collection of the purchased care network data, discrepancies regarding hospital stay location and surgeon location were apparent, leading to duplicate entries.<sup>56</sup> Also, this data originates from TRICARE claims, and does not reflect transfers to other hospitals in the event of a serious complication post-operation.<sup>56</sup> The actual location of the procedure performed may not be the same as where the claim originates, thus complicating actual volume tracking.<sup>56</sup> Finally, this frequency data does not speak to quality metrics of the provider or the facility as it does not include outcomes data. While it is difficult to obtain TRICARE quality and outcome data, data from HEDIS and claims data can provide some insight.<sup>50</sup> However, there are outcome-based programs being piloted including a pediatric cardiac surgery pilot program that allows patients to go to one of several top pediatric centers for their complex cardiac surgery.<sup>50</sup> Additionally, the TRICARE East Region MCSC (Humana Military) requires outpatient behavioral health providers to collect data for post-traumatic stress disorders (PTSD), anxiety, and depression.<sup>50</sup>

### C.5 CLINICAL QUALITY MANAGEMENT ACROSS THE ENTERPRISE

In the first report of this tasking, the Board reviewed the MHS Quality Assurance Program and DoD Patient Safety Program.<sup>4</sup> Since publication of that report in November 2018, and in preparation for the DHA to manage and administer all MTFs per *NDAA FY 2017 Section 702*, the DHA is generating issuances to standardize crucial processes MHS-wide.<sup>52,53</sup>

Planning for an integrated and standardized quality assurance and patient safety capability across the direct and purchased care networks is underway.<sup>53</sup> A description of the future state is provided below.

The DHA intends to publish the DHA Clinical Quality Management (CQM) procedure manual in 2019.<sup>53</sup> It is planned to be accompanied by a “Learning Series” for MHS leaders, quality and safety professionals, and health care providers.<sup>53</sup> This manual describes the procedures for each



of the six programs comprising CQM: (1) Patient Safety, (2) Health Care Risk Management, (3) Credentialing and Privileging, (4) Accreditation and Compliance, (5) Clinical Measurement, and (6) Clinical Quality Improvement.<sup>53</sup> Procedures described will be applicable to operational environments to the extent practicable, and guide relevant standards in purchased care as stipulated in respective contracts.<sup>53</sup>

The Clinical Measurement Program supports the DHA Deputy Assistant Director for Medical Affairs (DAD-MA) with analysis and recommendations on the use of measures addressing the quality strategy.<sup>53</sup> As discussed in the first report of this tasking, there is nascent establishment of multidisciplinary Clinical Communities to develop patient-centered care pathways that decrease variance and improve outcomes.<sup>53</sup> Care pathways are to address a patient's experience holistically, to include navigating health care services in both direct and purchased care.<sup>53</sup> In addition, quality measures that apply to both direct and purchased care at the provider level, would facilitate assessing the effectiveness of the DHA's efforts.<sup>53</sup> An action plan has been developed by the DHA Clinical Measurement Program, in conjunction with the DHA TRICARE Health Plan, to collaborate with the Centers for Medicare and Medicaid Services (CMS) and the National Quality Forum (NQF) to determine additional opportunities for integration of direct and purchased care measures.<sup>53</sup>

Implementing *NDAA FY 2017 Section 702* has presented challenges for DHA implementation of CQM as DHA has had minimal capability for Health Care Risk Management, Credentialing and Privileging, Accreditation and Compliance, and Clinical Quality Improvement; and very little capability, when compared to the Services, in Patient Safety and Clinical Measurement.<sup>53</sup> Furthermore, these programs have only recently been delineated in the development of the DHA Procedures Manual (DHA-PM) that is to replace the DoD Manual 6025.13 Medical Quality Assurance and Clinical Quality Management in the MHS, and the standardization of the many complex CQM processes and procedures across the three Services.<sup>53,123</sup> The Service Surgeons General will remain Privileging Authorities in respective operational environments, but will need to implement the DHA-PM to the extent practicable.<sup>53</sup> As CQM programs become staffed, DHA internal processes and procedures will still need to be established, to include how to communicate and share knowledge with the DHA Markets/MTFs and the Services.<sup>53</sup>

The DHA manages quality in direct care, whereas MCSCs manage quality in purchased care with oversight by DHA clinical quality managers.<sup>50,51</sup> MHS quality and patient safety metrics are tracked in dashboards, one for each of the direct and purchased care networks. The direct care dashboard contains 64 measures (shown in Table 5 by QPP) while the purchased care dashboard has 18 measures (shown in Table 6). Only eight of the measures (indicated in blue in Table 5 and Table 6) are the same, limiting comparisons at the enterprise-level.<sup>49-51,124</sup>



**Table 5. MHS Core Dashboard for Direct Care<sup>124</sup>**

Quadruple Aim	Measure Name	Quadruple Aim	Measure Name
<b>Better Care</b>	Risk Adjusted Mortality (Standardized Mortality Ratio)	<b>Improved Readiness</b>	Individual Medical Readiness (IMR)
	NSQIP* All Case Morbidity		Percent of Providers Meeting (Knowledge, Skills, and Abilities) KSAs for General Surgery
	NSQIP* All Case Mortality		Percent of Providers Meeting (Knowledge, Skills, and Abilities) KSAs for Orthopedic Surgery
	Inpatient: Recommend Hospital (Patient Satisfaction with Care)		Active Duty Non-Deployability
	Catheter-Associated Urinary Tract Infection (CAUTI) Standardized Infection Rate		Capacity to provide health services for validated RFFs ISO*** conventional force requirements
	Central Line-Associated Blood Stream Infection (CLABSI) Standardized Infection Rate		Capacity to provide health services for validate RFFs ISO*** non-conventional force requirements
	Wrong Site Surgery		Percent of Fill Against Authorized Billets
	University Research Funding Opportunities		Defense Readiness Reporting System (DRRS) (Service)
	Diabetes A1C Testing		Health Related Quality of Life (HRQOL)
	Low Back Pain		Obesity Prevalence in Adults
	Children with Pharyngitis	Obesity Prevalence in Children	
	Breast Cancer Screening	Overweight Prevalence in Adults	
	Cervical Cancer Screening	Overweight Prevalence in Children	
	Colon Cancer Screening	Smoking Cessation	
	7-Day Mental Health Follow-Up	Tobacco Use Rate	
	All Cause Readmissions	Per Member Per Month (PMPM)	
	Primary Cesarean Section	Total Purchased Care Cost	
	Post-Partum Hemorrhage	Private Sector Care Cost	
	Unexpected Newborn Complications	Total Empanelment	
	Well Child Visits	Pharmacy Percent Retail Spend	
	Primary Care Manager (PCM) Continuity	Active Duty: Specialty Care Provider Efficiency	
	Potentially Recapturable Primary Care Leakage to the Network	Operating Room Utilization	
	Ambulatory Specialty Care Leakage	PCM Empanelment	
	Third Next Available Future Appointments	Savings from Enterprise Shared Services and Reform Initiatives	
	Third Next Available 24 Hour Appointments	Average Daily Patient Load	
	Specialty Care: Average Days from Referral to Booking	Intensive Care Unit Bed Days	
	Specialty Care: Average Days from Booking to Appointment	<p>Blue indicates the eight overlap measures on the direct care and purchased care dashboards</p> <p>*NSQIP–National Surgical Quality Improvement Program                      **ACGME–Accreditation Council for Graduate Medical Education                      ***RFF ISO–Request for Forces in Support Of</p>	
	Secure Messaging Enrollment		
	Secure Messaging Response Within One Business Day		
	Outpatient Provider Communications Composite		
	Getting Care When Needed		
	Active Duty Access for Primary Care		
Active Duty Access for Specialty Care			
Base/Operating Commander Assessment of Health Services Support			
Integrated Disability Evaluation System (Cycle Time)			
Residency Review Committee (ACGME**) Pass Rate			
Joint Commission (Accreditation)			
College of American Pathologies (CAP)			



**Table 6.** Purchased Care Dashboard Measures<sup>124</sup>

Measure Name	Measure Name
Diabetes: Annual A1C Testing	Referrals to Non-Network
Imaging for Low Back Pain	7-Day Mental Health Follow-up
Children with Pharyngitis	Well Child Visits
Children with Upper Respiratory Infection (URI)	(M1) Medical capability reports provided to CCMDs upon request
Provider Communication	(M2) Are commands satisfied with the quality of the reports?
Care Coordination	(M1) Percentage of Patients moved from theater by TOP Contractor when deferred by TRANSCOM
Beneficiary Satisfaction w/online enrollment svc	(M2) Percentage of patient movement requests where a "go/no go" decision was provided to the unit within 90 minutes
Access to Care (ATC) Days to Specialty Care (Prime Enrolled)	Per Member Per Month (PMPM)
Active Duty Dental Care Access	Private Sector Care Cost
Blue indicates the eight overlap measures on the direct care and purchased care dashboards	

The MHS continues to evolve with regard to its three concurrent transformations: (1) the DHA’s management and administration of all MTFs as directed by the *NDAA FY 2017 Section 702*, (2) its high reliability journey in response to mandates following the 2014 Secretary of Defense MHS Review, and (3) the deployment of an electronic health record (EHR) for inpatient, outpatient, in-garrison, and deployed documentation of patient care.<sup>52,53,125</sup> Support of these efforts includes strategic partnerships, participation in clinical quality improvement networks or registries, and audit or evaluation of salient programs to improve patients’ health and clinical outcomes in the delivery of health care.<sup>53</sup>

### C.6 OBSERVATIONS

The consistency and quality of care is of utmost importance regardless of where the patient obtains care and should be standardized where possible. A comprehensive view of quality includes NSQIP data, registries and databases derived from the EHR, identification of adverse events and care vulnerabilities through the patient safety programs, peer-review programs, and ongoing system analysis.<sup>4</sup> Through examination of clinical quality management within the purchased care network, the themes of oversight, standardization and resourcing emerged. The following observations are made:

- (1) Recent restructuring in DHA TRICARE quality oversight has resulted in the new DHA Policy and Integration Division personnel including two medical directors physicians (one for TRICARE East and one for TRICARE West), and one quality nurse consultant. There are also two additional quality nurse consultants who oversee clinical quality management activities for the USFHP. The Division is responsible for quality oversight for up to 9.5



million beneficiaries. This has resulted in additional staff responsibilities without additional support or resources.

- (2) The DHA Policy and Integration Division is revising and developing policy and integration that further aligns direct care with purchased care, including the quality dashboards, selecting quality measures that will establish expectations for network providers and provide incentives for providers who exceed standards and set forth corrective actions for those not meet minimal standards, and implementing Leapfrog Safety Grades and Leapfrog Survey throughout purchased care.
- (3) The ACS NSQIP is utilized in all 48 inpatient surgical MTFs. However, it is not required in the current MCSCs. Further, for the TRICARE network providers who do participate in NSQIP, there is no contractual requirement for the providers to provide the data to the DHA clinical quality managers.
- (4) The available TRICARE quality and outcome data are limited aside from claims data.
- (5) Quality assurance and patient safety across the enterprise are essential lines of effort as the DHA assumes management and administration of all MTFs pursuant of *NDAA FY 2017 Section 702*.
- (6) It is vital that quality and safety programming is (1) appropriately staffed and resourced; (2) fully funded; and (3) standardized across the direct and purchased care networks. Quality assurance and patient safety in the deployed environment must be considered in this programming as well.



## APPENDIX D. THE SURGICAL VOLUME PLEDGE AND APPROACHES TO SURGICAL QUALITY AND PATIENT SAFETY

### D.1 INTRODUCTION

This appendix examines the Surgical Volume Pledge initiative (referred to hereafter as the Volume Pledge) adopted in 2015 by three academic hospitals. The first report of this tasking (see Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*) provided an overview of the volume-outcome relationship and found that volume alone is an imperfect standalone measure of quality.<sup>4</sup> This appendix specifically addresses the following objective in the Terms of Reference (TOR): “Evaluate potential for the MHS to sign on to the ‘Surgical Volume Pledge’ agreed to by Dartmouth-Hitchcock Medical Center, Johns Hopkins Medicine, and the University of Michigan.” Although the TOR focuses on the Volume Pledge, a broader assessment of surgical quality was imperative.

The first part of this appendix evaluates the Volume Pledge at the three founding institutions, as well as surgical quality programs at facilities that did not join the initiative including the Department of Veterans Affairs (VA), Kaiser Permanente, Mayo Clinic, and Massachusetts General Hospital. The remainder of the appendix examines quality initiatives by the American College of Surgeons (ACS) quality initiatives and the Leapfrog Group.

Some appendix sections originally appeared in the first report of the tasking and are included for background and further analysis. See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> where applicable for more information.

### D.2 THE SURGICAL VOLUME PLEDGE

In May 2015, Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System pledged that their hospitals would meet annual volume thresholds for 10 surgical procedures for both the hospital and the surgeon.<sup>32</sup> The Volume Pledge represents an agreement that within their academic medical system, the facilities pledge to direct surgical care for certain procedures to facilities meeting the thresholds; it does not specify requirements of performing complex surgery in small and rural hospitals.<sup>7,34</sup> The Volume Pledge was promoted by advocates of quality improvement including Dr. John Birkmeyer and Dr. Peter Pronovost.<sup>34</sup> Johns Hopkins Medicine and Dartmouth-Hitchcock Medical Center did not have Chairs of Surgery when the decision was made to join the Volume Pledge.<sup>43</sup>

The 10 surgical procedures identified by these academic institutions are those that have the strongest link between hospital volume and patient mortality.<sup>8,32</sup> The surgical procedures were selected by six expert panels of six surgeons per panel from various specialties at Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System.<sup>8</sup> The 10 procedures are divided into four categories: cancer resections (esophageal, lung, pancreatic, rectal), cardiovascular procedures (carotid artery stenting, complex abdominal aortic aneurysm, mitral valve repair), general procedures (bariatric staple surgery), and orthopedics



(knee replacement, hip replacement). Many of the 10 procedures consist of multiple types of surgeries, such as the category for “complex aortic surgery” including thoracic aortic surgery, valve surgery, and aortic aneurysm surgery.<sup>32</sup> Annual Volume Pledge hospital and surgeon minimums (i.e. volume thresholds) are shown in Table 7. According to Volume Pledge, hospitals and surgeons that perform fewer than the volume threshold are not permitted to perform that specific procedure; patients are directed to seek care at another center that meets the minimum volume requirement.<sup>8,33</sup>

**Table 7. Volume Pledge Hospital and Surgeon Volume Thresholds<sup>8</sup>**

	Procedure	Hospital Volume/Year	Surgeon Volume/Year
	Bariatric surgery	40	20
Cancer resections	Esophagus	20	5
	Lung	40	20
	Pancreas	20	5
	Rectum	15	6
Cardiovascular	Carotid arterial stenting	10	5
	Complex aortic surgery	20	8
	Mitral valve repair	20	10
Orthopedics	Hip replacement	50	25
	Knee replacement	50	25

Since taking the Volume Pledge, the three institutions that signed onto the initiative continue to vary in adoption and execution. For example, Johns Hopkins Medicine consolidates hip and knee replacements at one center in their system that is not considered “high-volume.”<sup>126</sup> Other facilities not considered “high-volume” within Johns Hopkins Medicine continue to perform complex operations included in the Volume Pledge.<sup>43</sup> Johns Hopkins Medicine does not focus on volume-based credentialing; instead, they conduct Professional Practice Evaluation (PPE) similar to the American Board of Surgery, with monthly case reviews.<sup>126</sup> Additionally, Johns Hopkins Medicine focuses on a multifaceted quality approach that utilizes case reviews and morbidity and mortality out-briefs.<sup>126</sup>

Dartmouth-Hitchcock Medical Center meets the Volume Pledge thresholds by internally shifting procedures between facilities belonging to their Medical Center.<sup>8</sup> It monitors surgeon volumes as part of the privileging process to ensure that surgeons who fall below thresholds participate in apprenticeships or reconfigure their practices to clear the thresholds.<sup>8</sup> During implementation of the initiative at Dartmouth-Hitchcock, the majority of surgeons who fell below the minimum standards were receptive to feedback, with some surgeons deciding get additional training or reconfigure their practice; others decided to stop practicing certain procedures.<sup>8</sup>

Because of tracking difficulty for surgeons who perform operations at multiple hospitals, the University of Michigan Health System uses surgeon attestation in the privileging process to confirm minimum volume requirements.<sup>127</sup> Although the University of Michigan Health System considers volume in its privileging process, it also recognizes other complex procedures similar to those included in the Volume Pledge.<sup>127</sup> The Volume Pledge in many ways was symbolic and



did not significantly affect practices at these institutions because they were already large hospitals that met or exceed the minimum volume thresholds.<sup>8,127</sup>

Similar to the Volume Pledge, the Leapfrog Group (referred to hereafter as Leapfrog) focuses on surgical volume. Leapfrog, a non-profit organization that collects and publicly reports information about the safety and quality of inpatient hospital care, began publishing hospital surgical volume data for the 10 surgical procedures identified in the Volume Pledge in 2017.<sup>61</sup> Like the Volume Pledge, Leapfrog's Surgical Volume Standards identify annual minimum hospital and surgeon volume thresholds. Leapfrog standards also indicate that a hospital's privileging process include a minimum surgeon volume.<sup>60</sup> In 2018, Leapfrog removed hip and knee replacement procedures from its list of Surgical Volume Standards.<sup>61</sup> In 2018, the MHS began reporting data, including volume, to Leapfrog (see section D.5 for more information).

### APPLICABILITY OF THE VOLUME PLEDGE TO THE MILITARY HEALTH SYSTEM

Although the intent of mandatory volume thresholds through initiatives like the Volume Pledge is to improve patient safety and quality of care, there are concerns and possible negative consequences if implemented within the MHS due to the system's unique characteristics. "The MHS is a federated system of uniformed, civilian and contract personnel, and additional civilian partners at all levels of the Department of Defense (DoD)."<sup>22</sup> It is one of America's largest and most complex health care systems with 9.5 million beneficiaries, as well as one of the nation's largest health benefit plans.<sup>128</sup> The mission of the MHS is complex: to ensure America's 1.4 million active duty and 331,000 Reserve Component personnel are medically fit to complete their national security missions; to ensure that all active and reserve medical personnel in uniform are trained and ready to provide medical care in support of operational forces; and to provide a medical benefit commensurate with the service and sacrifice of active duty personnel, military retirees, and their families.<sup>5</sup>

The challenges of the MHS are unlike any other health care system in the world; it must execute its mission requirements in both contingency and peacetime environments.<sup>7</sup> The contingency mission includes ensuring military forces are a medically ready force and that the medical Service members deployed are a ready medical force, able to provide complex care in combat zones.<sup>7</sup> The peacetime mission includes providing health care for military members, families, and other beneficiaries stateside and overseas.<sup>7</sup> Further, due to these mission requirements, remote MTF locations, and deployed environments, some procedures are conducted in low frequencies.

The implementation of surgical volume thresholds, through the Volume Pledge initiative, would pose unique challenges to the MHS who must operate in remote/rural or deployment areas. The Volume Pledge, which has only been implemented in three metropolitan areas, calls for redirection of certain surgeries to fewer, centralized hospitals through regionalization. Regionalization may lead to social disadvantages, such as prolonged patient/family separation and disparities in access to care, such as patients who are limited by their ability to travel.<sup>10,25,33</sup> This is especially concerning for the patient population served at MTFs which may be located outside of metropolitan areas. Additionally, military surgeons operating at rural MTFs may lose case load complexity if restricted from performing certain surgical procedures. There may also



be professional consequences from implementation of the Volume Pledge, such as an impact on the career path of surgeons because of a narrowed scope of practice, as well as influence of the surgeon's joy in practice and reduction of physician recruitment.

The Volume Pledge's 10 surgical procedures are selective, complex, and elective. An area of concern of directly applying these volume standards from the civilian sector to the military sector is that none of the procedures are emergent in nature; they do not represent the high-intensity procedures performed within the MHS, specifically in theater care. Further, the procedures within each of the 10 categories vary greatly in complexity and prevalence. For example, the complex aortic surgery data reflect 33 current procedural terminology (CPT) codes, including open aortic aneurysm and endovascular repairs.<sup>122</sup> The open aortic mortality rate is often higher than endovascular repair, which is less invasive than open surgery and the preferred treatment for many people with an abdominal aortic aneurysm (AAA).<sup>129</sup> See Attachment Two for a complete list of CPT codes for the 10 surgical procedures.

In addition to the 10 "low-volume high-risk" surgical procedures, there is also concern with defining the minimum volume thresholds. Because the Volume Pledge and the associated literature use discrete categorization to define volume thresholds, an element of arbitrariness exists.<sup>15,36</sup> If the threshold is 10 surgeries, a surgeon who performs 9 surgeries is considered "low-volume," while a surgeon who performs 10 surgeries is considered "high-volume." Thus, there is a statistical concern when arbitrary cut-off points are created.<sup>15</sup> The volume thresholds also only take into account the individual surgeon and/or the entire hospital. Medicine in general, specifically surgery, involves the entire team, not just the individual surgeon; teams are important when measuring quality.<sup>7,126,127</sup> This is especially important when complications arise; the entire team must be sufficiently resourced and trained to provide a high level of care.<sup>127</sup> Every military surgical team member is critical for success.<sup>7</sup> However, the Volume Pledge's established thresholds do not acknowledge the team, including a second or third surgeon who may be supporting the procedure.

In general, there is a relationship (correlation) between surgical volume and outcomes based on peer-reviewed literature (see Appendix B). However, this is an overly simplistic relationship.<sup>35</sup> There are multiple factors related to better outcomes such as team proficiency, infrastructure, and the ability to rescue in complex cases.<sup>35</sup> Additionally, the Volume Pledge causal efficacy has not been fully demonstrated as outcomes data have not been published in any peer reviewed literature. Before sophisticated, robust systems, focused on risk-adjusted data were available, volume was a sufficient metric.<sup>59</sup> Counting numbers of procedures is also administratively easy and can be understood by broad audiences.<sup>43</sup> Yet surgical quality efforts that go beyond volume have vastly improved since the early 1900s, when volume first emerged as a proxy for quality. Positive surgical outcomes are achieved through more than volume, such as good surgical technique and judgement, proper support services, sound hospital structural processes, and appropriate surgical candidate selection.<sup>36</sup> Moreover, without Volume Pledge outcomes data, caution should be used in further adoption of the initiative.<sup>15</sup> Due to MHS's unique challenges, including completing high-intensity procedures in varied locations, and the lack of Volume Pledge causal efficacy, it is beneficial to further examine other approaches to optimize surgical quality of care.



### D.3 SURGICAL QUALITY PROGRAMS AT NON-VOLUME PLEDGE INSTITUTIONS

Since the creation of the Volume Pledge in 2015, only the three original health systems have joined the initiative. This section examines alternative approaches to surgical quality within the government and civilian health care sectors that do not rely on volume as the primary measure.

#### VETERANS HEALTH ADMINISTRATION FACILITY INFRASTRUCTURE MODEL

In the first part of this tasking,<sup>4</sup> the Board was tasked to review the Veterans Health Administration (VHA) Operative Complexity Directives (VHA 2010-018<sup>39</sup> and VHA 2011-037<sup>130</sup>) which provides a systematic approach to ensuring each VA facility has proper infrastructure to meet the complexity of procedures performed.<sup>21</sup> Through the assessment, the Board made the following recommendations related to these Directives:

**Recommendation 10:**<sup>4</sup>

- A) The MHS must adopt patient safety and quality programs similar to those within the VA. Quality programs that ensure collaboration of safety and a wider systems-approach with root cause analysis and the opportunity to respond to close calls (near misses) in real-time are critical for maintaining quality of care.
- B) The MHS must adopt an infrastructure approach similar to that within the VA (VHA 2010-018<sup>39</sup>).

The section below provides a brief summary from the first part of the tasking on the VHA facility infrastructure model. See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> for more information.

The VHA is a large, integrated system that serves 9 million enrolled veterans a year by providing care at 1,250 health care facilities, including 172 medical centers, 112 surgery programs, and 1,069 outpatient clinics of varying complexity.<sup>131,132</sup>

In 2007, the VA identified a mortality rate over four times the expected rate as calculated (through NSQIP) during the first two quarters of 2007 at one VHA medical center.<sup>133</sup> The Office of Inspector General (OIG) Office of Healthcare Inspections (OHI) concluded that there were specific problems of quality of care including pre-operative, intra-operative, and post-operative care for veteran patients.<sup>133</sup> The review also concluded that independent of physician expertise, the availability of support services were important and may provide a guide to where certain procedures should be performed.<sup>133</sup> Thus, the VHA took three steps to address these issues.

- (1) Develop two matrices: (1) The Procedure Infrastructure Matrix designated the infrastructure requirements for a VHA facility with an inpatient surgical program as one of three levels: standard, intermediate, or complex; and (2) The Surgical Complexity Matrix uses the same CPT codes to categorize surgical procedures.<sup>40</sup>
- (2) Delineate the structural framework for nationwide implementation and monitoring. The Veterans Integrated Services Network (VISN) Surgical Workgroup was established in each



- of the VA's 21 VISNs (regional networks) and created 16 Surgical Advisory Boards composed of more than 90 subject matter experts (SMES) from significant disciplines.<sup>40</sup>
- (3) Publish the *Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures* (VHA 2010-018<sup>39</sup>) policy requiring each VHA medical facility with an inpatient surgical program to follow an infrastructure-based surgical complexity designation.<sup>40</sup> “The designations are as follows:
- (a) Standard facilities provide surgical procedures characterized as having minimal risk, such as breast biopsies, appendectomies, and hernia repair.
  - (b) Intermediate facilities provide more advanced procedures, such as gastric resections, prostatectomies, hip replacements, and spine surgery.
  - (c) Complex facilities provide procedures such as cardiac surgery, neurosurgery, complex thoracic procedures, and complex general surgery procedures.”<sup>40, p. 1-2</sup>

Each VHA facility is responsible for ensuring that “scheduled, non-emergent surgical procedures do not exceed their infrastructure capabilities.”<sup>40, p.2</sup> Of note, the directive was designed to not interfere with either a surgeon’s judgement in performing a surgical procedure beyond the surgical complexity designation of the facility when presented with new findings at the time of a planned procedure, or in handling an emergency condition where it is in the patient’s best interest to provide care on-site rather than transferring the patient to a more complex facility.<sup>40</sup>

The 2011 *Facility Infrastructure Requirements to Perform Invasive Procedures in an Ambulatory Surgery Center* (VHA 2011-037<sup>130</sup>) directive established “policy and procedures regarding the infrastructure requirements for VHA facilities providing surgical services in an Ambulatory Surgery Center (ASC) in relationship to the complexity of the surgical procedures being performed, as well as the method for monitoring compliance.”<sup>130, p.1</sup> VHA 2011-037 does not impact or supersede VHA 2010-018.<sup>130</sup>

In other words, each VHA facility is designated a complexity level which designates the procedures that fall within the assigned complexity level. Patients are directed to facilities based on their surgical procedure requirements.<sup>21</sup> Procedures that are conducted beyond the complexity level designation of the hospital are tracked and evaluated to ensure a high level of care.<sup>21</sup> Furthermore, according to the standards developed by the VHA for surgical complexity, half of the 10 procedures identified in the Volume Pledge would be considered standard or intermediate, not complex.<sup>ii</sup> The vast difference between standard and intermediate operative complexity is primarily due to the robust infrastructure, including the use of consultants, telehealth, and intensive care units (ICU) at the intermediate level.<sup>21</sup> Furthermore, the standard operative category surgical programs tend to reside in rural VHA facilities which are not affiliated with academic institutions.<sup>21</sup>

The VHA facility infrastructure directives (VHA 2010-018<sup>39</sup> and VHA 2011-037<sup>130</sup>) take a more sophisticated approach to quality than simply looking at volume alone.<sup>4</sup> The Board’s previous recommendation to adopt an infrastructure approach similar to the VHA focuses beyond the

<sup>ii</sup> Standard or intermediate: lung cancer resection, rectal cancer resection, carotid artery stenting, knee replacement, and hip replacement

Complex: esophageal cancer resection, pancreatic cancer resection, complex abdominal aortic aneurysm, mitral valve repair, and bariatric staple surgery



individual surgeon; it focuses on the entire surgeon team including team dynamic and team performance, as well as facility capabilities.<sup>4</sup>

## CIVILIAN SYSTEMS PERSPECTIVE ON QUALITY OF CARE AND SURGICAL VOLUME

As only three institutions have joined the Volume Pledge since its formation in 2015, it is important to assess other approaches to surgical quality of care. The following section examines three institutions often considered as leaders in the delivery of high quality care: Kaiser Permanente, Mayo Clinic, and Massachusetts General Hospital. These facilities have not joined the Volume Pledge; however, they still demonstrate exemplary approaches to addressing overall quality of care. Practices, such as surgeon rotations, robust peer reviews, and monitoring of risk-adjusted outcomes data, may have specific applicability to the MHS. It is important for the MHS to understand how leaders in civilian health care address quality and patient safety efforts since collaboration and adoption of successful practices may be applicable to the military health care environment.

### **Kaiser Permanente**

Kaiser Permanente is a large not-for-profit health plan serving 12.2 million members.<sup>134</sup> It uses volume standards for physician referrals, patient care and quality, regulatory and accreditation requirements, and performance outcomes.<sup>37</sup>

Kaiser Permanente identifies two types of surgical procedures: (1) Those that are performed at only specialized Kaiser Permanente medical centers; and (2) Procedures that are considered “high-volume low-risk,” such as hysterectomies and circumcisions.<sup>37</sup> “Low-volume high-risk” procedures are performed at only specific medical centers and may require expensive, specialized equipment not available in all facilities.<sup>37</sup> In contrast, “high-volume low-risk” procedures are usually performed at all Kaiser Permanente hospitals with generally low complications.<sup>37</sup>

In addition to volume, Kaiser Permanente considers other factors for addressing low-volume surgeons and surgeries. For example, it acknowledges patient travel times, membership growth projections, hospital capacity, including the ability of a hospital to absorb patients, with consideration of operating room time, inpatient beds, ICU beds, pathology, radiology, as well as surgeon satisfaction, recruitment of new surgeons, and workforce planning.<sup>37</sup> Some specialists, such as urologists, travel to other hospitals within the region to perform surgeries in higher volumes due to their specialty and need for robotic equipment, while other surgeons are paired with high-volume surgeons.<sup>37</sup>

Kaiser Permanente addresses quality outcomes through simulation, systematic optimization of patient pre-operation, peer review methods, review of surgical techniques through recordings, and a balanced distribution of complex cases to low- and high-volume hospitals and surgeons.<sup>37</sup> Additionally, Kaiser Permanente recognizes that flexibility in implementing volume recommendations is needed and it may be unnecessary to impose strict thresholds below which surgeons must stop performing a procedure or increase their annual procedure volumes.<sup>41</sup>



Using surgeon volume and outcome data from Kaiser Permanente Southern California and Kaiser Permanente Northern California, a 2018 study was conducted using the concentration curve methodology to depict the relationship between surgeon procedure volume and outcome.<sup>37,41</sup> The concentration curve methodology does not identify discrete procedure volume thresholds for which many articles in this field have been criticized.<sup>15,41</sup> Rather than developing volume thresholds, the analysis was used as a foundation for facilitating conversations about surgeon volume.<sup>41</sup>

## Mayo Clinic

Mayo Clinic is a non-profit organization that provides care to more than one million people per year with major campuses in Minnesota, Wisconsin, Arizona, and Florida.<sup>42,135</sup> Mayo Clinic is consistently ranked among the top hospitals in the nation.<sup>136,137</sup> Its multi-dimensional approach to quality entails electronic health record (EHR) data mining, use of risk-adjusted registries like NSQIP, and internal performance improvement processes designed to immediately identify and address quality issues when they occur.<sup>42</sup> Furthermore, quality is managed at the facility level by committees of administrators and quality management professionals, with input from SMEs for patient safety, mortality, health equity, and patient experience.<sup>42</sup> SMEs also monitor internal data and observe external public metrics and ranking/rating systems.<sup>42</sup>

Although Mayo Clinic is a leader in quality, it does not participate in volume focused initiatives like the Volume Pledge nor in the self-reported Leapfrog Hospital Survey. Mayo Clinic had participated in Leapfrog until 2015, when the decision was made to stop participating due to the large clerical burden associated with extracting and submitting the required data, and the belief that their mature health care system did not seem to be gaining a distinct benefit to their quality programs when compared to the administrative burden.<sup>42</sup> However, participation in the Leapfrog Hospital Survey will resume in 2020 under the strategic direction of Mayo Clinic's new Chief Executive Officer.<sup>42</sup> Regarding the Volume Pledge, Mayo Clinic did not join the initiative as it felt it would not significantly impact its practices as a quality-minded, high-volume center.<sup>42</sup>

Mayo Clinic, like the MHS, has facilities in remote/rural communities. To address the issue of surgical skill maintenance, Mayo Clinic has developed a hybrid position over the past four years where a community general surgeon participates in a "surgeon trade" in order to maintain skills for specific procedures that his/her community facility infrastructure cannot support.<sup>42</sup> The partner-surgeon model involves a "low-volume" surgeon rotating into a "high-volume" facility (and vice versa) for one to two weeks as a full-fledged team member, providing the patient with not only surgery, but also comprehensive pre- and post-operative care.<sup>42</sup> This model allows surgeons from "low-volume" facilities to maintain skills and be better prepared to handle the occasional complex case.<sup>42</sup> It also improves the understanding of what infrastructure is necessary to support complex cases, further helping to determine which cases should be done in the lower volume locations.<sup>42</sup> In addition, surgeons from "high-volume" centers, such as those in Rochester, MN, are able to learn about the environment and challenges of a lower-volume facility as they provide their expertise to the staff and facility.<sup>42</sup> The "surgeon trade" program is part of Mayo Clinic's culture and is well regarded.<sup>42</sup>

Mayo Clinic's clinical quality demonstrates that transparency efforts (i.e. the Leapfrog Hospital Survey) may impose significant administrative burdens with little to no improvement in surgical



quality. Moreover, Mayo Clinic’s “surgeon trade” program allows surgeons from environments of varying intensity to gain experience, skills, and understanding of the challenges of conducting surgery in high-intensity and rural locations.

The Board provided the following recommendation in the first part of this tasking related to surgeon and surgical team rotation:

**Recommendation 7:**<sup>4</sup>

The DoD must develop a rotation system for surgeons and surgical teams stationed at low-intensity sites to high-intensity sites, even for short periods of time, to sustain skills. High-intensity civilian environments must be leveraged through expansion of military-civilian partnerships to provide opportunities for the rotation of military medical teams.

**Massachusetts General Hospital**

Massachusetts General Hospital (MGH) is a leader in the delivery of quality health care and has been ranked among the top five hospitals in the United States since rankings began by U.S. News & World Report.<sup>137,138</sup> Although MGH acknowledges some association between surgical volume and outcomes for specific complex procedures, MGH did not join the Volume Pledge because the effort was not consistent with the institutional approach to optimizing procedural outcomes and would therefore detract from MGH’s focused efforts.<sup>43</sup> Of note, MGH already exceeds the minimum number of procedures for all types of procedures specified by the Volume Pledge.<sup>43</sup> MGH leadership consulted with surgical quality SMEs when considering joining the Volume Pledge.<sup>43</sup> While the Volume Pledge could be seen as benefiting a “high-volume” hospital like MGH by bringing in more patients and hence revenue, from a health system-wide perspective, the initiative was not considered to be in the best interest for overall patient care because it created clear distinctions among institutions when the reality of optimizing site of care is more nuanced and continuous.<sup>43</sup> In addition, the initiative could be seen as disproportionately benefiting academic centers so participation would be viewed as self-serving.<sup>43</sup>

Further, MGH considers the potential for negative consequences of joining the Volume Pledge. For example, an MGH community hospital, serving patients outside of the immediate Boston metropolitan area, provides care where options for patients are limited.<sup>43</sup> The senior surgeon performs some surgeries in limited numbers. If MGH implemented the Volume Pledge, the surgeon, despite having more than 20 years of experience and being selective in the cases performed, could perhaps be unable to perform any surgeries at this facility and impact patient access to care.<sup>43</sup>

Within the MGH delivery system, to ensure a high level of quality of care and safety at the community hospitals, surgeons do not perform operations that the facility cannot support (i.e. surgical procedures that require complex reconstructions).<sup>43</sup> Outcomes are closely monitored through NSQIP and other national comparative registries for quality and outcome improvement, specifically when high-intensity cases are performed.<sup>43</sup> Additionally, MGH and its affiliated institutions are supplementing these national registry data on appropriateness and patient reported outcomes.<sup>43</sup> The Partners System, of which MGH is a member, has a quality improvement working group, which includes the Chiefs of each hospital, that meets quarterly to review performance and initiate quality improvement processes.<sup>43</sup> Thus, in addition to volume,



such factors such as regional capacity, proximity to a patient’s home, surgical experience, and the degree of pro-active monitoring and oversight should all be considerations in assessing the appropriateness of a particular surgical procedure at a particular location.<sup>43</sup>

MGH, like the MHS, performs some surgical procedures in low frequencies due to facility locations. However, MGH is proactive in ensuring the highest possible level of care. Since some MTFs are similar to some MGH facilities in their locations outside of metropolitan areas, the MHS may benefit from adoption of some of MGH’s quality and safety processes.

#### D.4 AMERICAN COLLEGE OF SURGEONS SURGICAL QUALITY EFFORTS

Founded in 1913, the American Colleges of Surgeons (ACS) is a scientific and educational association of surgeons with a mission “to improve the quality of care for the surgical patient by setting high standards for surgical education and practice.”<sup>139</sup> The ACS quality programs aim to improve quality of surgical care that leads to greater access for patients, fewer complications, and better outcomes, thus lowering the cost of care.<sup>58</sup> Such quality programs have improved quality in overall surgical care, and specifically for trauma, cancer, and breast care.<sup>58</sup> The ACS quality improvement programs are based on four key principles:

- (1) Set the standards.
- (2) Build the right infrastructure (to support the standards).
- (3) Use the right data (to measure against the set standards).
- (4) Verify with outside experts (peer review verification).<sup>58,59</sup>

The following section describes these core principles through examination of various ACS programs and initiatives dedicated to surgical quality improvement. These initiatives include the manual *Optimal Resources for Surgical Quality and Safety*, ACS NSQIP, the work of the ACS Advisory Council on Rural Surgery (ACRS), and the MHS Strategic Partnership with the American College of Surgeons (MHSSPACS).

#### AMERICAN COLLEGE OF SURGEONS OPTIMAL RESOURCES FOR SURGICAL QUALITY AND SAFETY

The ACS *Optimal Resources for Surgical Quality and Safety* (hereafter referred to as *Optimal Resources* [i.e. the “Red Book”]) manual is the work of more than 100 contributing authors who are advocates of the health care quality movement and builds on the ACS’ long tradition of developing successful quality programs for improving surgical care.<sup>58</sup> It is an effort to delineate optimal resources to define outcomes and builds on successful models used across all other ACS quality programs including the Commission on Cancer, the Committee on Trauma, the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP), NSQIP, and the Children’s Surgery Verification Program.<sup>59</sup>



The ACS was not consulted during development of the Volume Pledge and Leapfrog’s Surgical Volume Standards initiatives.<sup>59</sup> Moreover, it has taken a stance on the volume-outcome debate. The 2018 ACS *Statement on Credentialing and Privileging and Volume Performance Issues*, developed by the Credentialing and Privileging and Volume Performance Issues Workgroup of the ACS, states: “While high case volume for a particular complex procedure is usually associated with better surgical outcomes, the two are not synonymous.”<sup>57</sup> Additionally, according to the ACS Workgroup, a minimal case number threshold for the required amount of experience of a rarely performed procedure or procedures for rare diseases is nearly impossible to define or to be meaningful.<sup>57</sup> Further, patient safety and the quality of surgical care depend on a variety of factors including training, experience, and skills of the surgeon, in addition to the availability of institutional resources (i.e. facility infrastructure), and the ability to measure surgical outcomes.<sup>57</sup> Rather than establishing simple numbers (i.e. volume thresholds) for

A 2018 ACS *Statement on Credentialing and Privileging and Volume Performance Issues* states: “While high case volume for a particular complex procedure is usually associated with better surgical outcomes, the two are not synonymous.”<sup>57</sup>

surgical privileging, like some of the Volume Pledge institutions, case selection criteria, experience with procedures of similar scope and technical requirements, analysis of both short- and long-term risk-adjusted surgical outcomes, and peer review data should be considered.<sup>57</sup>

Following completion of a standard approach to quality and safety through *Optimal Resources*, the ACS developed a hospital assessment program—the Surgical Quality Verification program. The pilot program is designed to guide facilities to create a programmatic approach toward surgical quality.<sup>60</sup> This includes a pre-review questionnaire, compilation of nearly 100 surgical patient charts, various other documentation reviews, and a two-day on-site visit with leadership and stakeholders.<sup>59,60</sup> The initiative was tested at four facilities including one MTF—Walter Reed National Military Medical Center (WRNMMC; discussed below)<sup>59</sup>—with consideration to expand to all MTFs. The evaluation criteria standards are shown in Table 8, based on the *Optimal Resources* manual.

**Table 8.** American College of Surgeons Surgical Quality Verification Program Evaluation Criteria Standards<sup>60</sup>

1.1 Commitment to a Surgical Quality and Safety Program	6.1 Surgical Credentialing and Privileging
1.2 Commitment to Team-Based Care	7.1 Culture of Patient Safety and High Reliability
2.1 Standardized Processes in Five Phases of care	8.1 Disease Based Management
3.1 Surgical Quality Officer	9.1 External Regulations in Patient Safety
4.1 Case Review Process	10.1 Data Surveillance
4.2 Peer Review Process for the Individual Surgeon	10.2 Data to Promote a Culture of High Reliability and Safety
5.1 The Surgical Quality and Safety Committee	10.3 Data for Improvement

The program focuses on the first nine chapters of *Optimal Resources*.<sup>44,59</sup>

- (1) *Optimal Resources for Surgical Quality and Safety: An Introduction*. The *Optimal Resources* manual of universally recognized principles to achieve excellent quality and safety.<sup>44</sup>



- (2) *Team-Based Care: The Surgeon as Leader in Each Phase of Surgical Care.* According to the ACS, the best way to reduce errors, complications, and variations of care is through a coordinated, physician-led, team-based approach. Team-based models should be rooted in:
- Shared decision making between the physician and patient/family
  - Risk stratification and reduction
  - Standardized adherence to high-reliability patient-safety standards
  - Evidence-based care
  - Effective coordination of surgical care.
- Furthermore, the specific roles and responsibilities of all team members, including the surgeon, should be defined locally for the five phases of surgical care (surgical preoperative evaluation and preparation, immediate preoperative readiness, intraoperative, postoperative, and postdischarge).<sup>44</sup>
- (3) *Surgical Quality Officer.* The Surgical Quality Officer (SQO) leads efforts to establish and maintain the infrastructure and standards for surgical care and ensures that all team members have the proper tools, resources, training, and competencies to provide high-quality care.<sup>44</sup> Furthermore, the SQO should identify and address system errors and develop countermeasures where problems exist.<sup>44</sup> This position has traditionally been filled by the hospital's Chief Medical Officer (CMO); however, continuous QI extends beyond duties the CMO can perform.<sup>44</sup>
- (4) *Care Review and Peer Review: Forums for Quality Improvement.* Individual level case review and data review serve to ensure that surgical patients are provided high-quality, safe, and reliable care.<sup>44</sup> There are five different types of reviews: single discipline case review, multidisciplinary case review, peer review of individual surgeons, data/registry review, and educational review conferences.<sup>44</sup>
- (5) *The Surgical Quality and Safety Committee: Providing the Operational Infrastructure to Ensure Quality, Safety, and Reliability.* The Surgical Quality and Safety Committee (SQSC) oversees quality evaluations and recognizes/supports/leads the performance of surgical quality assurance initiatives. Specific SQSC responsibilities include:
- Overseeing quality, mortality, and adverse event rates
  - Addressing clinical practice variation
  - Establishing quality and safety standards, guidelines, and surgery-related policies
  - Monitoring primary data and data reports to identify consistent surgical issues (through a variety of surgery-related data registries like NSQIP, National Trauma Data Bank/Trauma Quality Improvement Program (TQIP), and the Society of Thoracic Surgeon (STS) National Database). Data is important for the SQSC to monitor for prioritized performance improvement projects and initiatives.<sup>44</sup>
- (6) *Surgical Credentialing and Privileging: Ensuring that Surgeons are Capable of Providing Optimal Care.* Credentialing uses standard objective criteria that are commonly used in most U.S. health care facilities, such as completion of an Accreditation Council on Graduate Medical Education (ACGME), graduation from a Liaison Committee on Medical Education, and verification of past performance. The privileging process designates the specific surgical procedures that a surgeon is allowed to manage and perform at the institution. This process varies based on institutional practices. Furthermore, for complex procedures that have the possibility of a high risk of adverse outcomes such as pancreatic and liver resection, privileging bundles are often used to differentiate between core and



more advanced procedures. Complex, infrequently performed procedures that have shared anatomic, pathologic, and technical challenges are sometimes bundled together.<sup>44</sup>

- (7) *Creating a Culture that is Focused on Safety and High Reliability.* “Culture refers to the set of shared attitudes, values, goals, and practices that characterize an institution or organization.”<sup>44, p.87</sup> Traditional hospital culture generally impedes patient care; thus, many organizations are focused on implementing a model similar to that of a high reliability organization (HRO). HROs focus on development and implementation of effective systems, transparency, and teamwork with the intent to solve process and system faults in a non-punitive way. Moreover, this model uses lessons learned from analysis of errors and sharing best practices to mitigate future errors. There are five characteristics of a culture of safety and high reliability: preoccupation with failure, sensitive to operations, reluctance to simplify interpretation, commitment to resilience, and deference to expertise. When taken together, a “just” culture is created that fosters a learning environment. Additionally, there are several models of effective culture change, including the frequently cited crew resource management (CRM) model. CRM was created to address aviation issues and centers on training and managing all resources (teams, equipment, procedures, and systems). The CRM model has been successfully implemented by the Navy through operational risk management (ORM) and by Kaiser Permanente’s Southern California region through Highly Reliable Surgical Team (HRST) model.<sup>44</sup>
- (8) *Patient Safety and High Reliability: Establishing the Infrastructure.* Root cause analysis (RCA) should be done on every patient safety report to identify the underlying problems that increase the likelihood of errors. Registries, like NSQIP (discussed in the following section) allow for aggregation of data from multiple institutions which allows medical personnel to use their risk-adjusted observed-to-expected ratios as benchmarks and baselines for improvement of outcomes. Standards and evidence-based guidelines can be developed after collecting and analyzing data. The ACS Committee on Trauma (COT) has successfully implemented high reliability in medicine with the production of international standards for delivering quality care rooted in evidence-based best practices. The COT aims for continuous quality improvement. The components of COT’s model include: adequate resources, monitoring processes and outcomes, standardization around best practices, training, mobilizing experts, and detecting and correction variation.<sup>44</sup>
- (9) *Disease Management and Multidisciplinary Patient Care.* A hospital quality program encompasses specific quality improvement initiatives for the multiple specialties within surgery. Patient care and quality, and regulatory requirements and accreditation are explained for general surgery, surgical oncology, trauma surgery, surgical critical care, emergency general surgery, burn surgery, abdominal transplant surgery, vascular surgery, bariatric and metabolic surgery, pediatric surgery, rural surgery, complex gastrointestinal surgery, orthopaedic surgery, urology, neurological surgery, cardiothoracic surgery, otolaryngology, gynecologic surgery, and plastic surgery.<sup>44</sup>

In October 2018, WRNMMC became the second hospital (first in the MHS) to participate in the ACS Surgical Quality Verification program rooted in the principles outlined in the manual *Optimal Resources*.<sup>60</sup> The effort was conducted through the MHSSPACS.<sup>60</sup> The ACS delivered its report of WRNMMC quality strengths and opportunities in December 2018.<sup>60</sup> According to the ACS, WRNMMC’s overall strengths include:

- A culture of transparency and commitment to quality and safety;



- Anesthesia commitment to pre-operative readiness with the ambulatory procedure unit and existence of the Medical Education and Training Campus (METC);
- Emergency general surgery data capture;
- Quality management control (QMC) for case review and document;
- Peer buddy system during peer review; and
- Health Care Resolutions program that includes mediation, peer support, and disclosure training.<sup>60</sup>

The ACS report also included overall opportunities for WRNMMC such as:

- Need for more consistency in case review process at specialty department level;
- Pre-operative protocol/checklist development for pre-operative evaluation and readiness, specifically for the geriatric population;
- Better defined process for Service-level case and peer review; and
- Additional resources dedicated to the Deputy Director for Quality and the Perioperative Quality Committee to support a more robust program for data analysis and surgical quality improvement initiatives.<sup>60</sup>

The site visit provided the opportunity for a structured internal review of the perioperative care provided throughout all surgical services and the detailed report offered actionable information regarding areas for improvement.<sup>140</sup> The visit also illustrated the benefits of military-civilian partnerships by delivering a mutual beneficial effort—expert input for WRNMMC on how to improve its overall approach to surgical quality and a critical opportunity for the ACS to continue its development of a nascent program.<sup>140</sup>

The *Optimal Resources* approach is continuously developing. For example, the rural program is a derivative created to help rural facilities, including MTFs, who are particularly challenged by minimal resource allocation and low volume.<sup>59</sup> The following section addresses the ACS efforts with rural surgery. Another recent effort being developed and grounded in the *Optimal Resources* approach is the verification/validation program for small hospitals.<sup>59</sup> Of note, the program does not require small/rural hospitals to participate in NSQIP; however, commitment to data collection is required.<sup>59</sup> Through this effort, if a small hospital implements the first nine chapters of *Optimal Resources* (discussed above) then the ACS could provide certification.<sup>59</sup>

### **American College of Surgeons National Surgical Quality Improvement Program**

Registries, such as the ACS NSQIP, play a vital role in high reliability and patient safety.<sup>44</sup> The first part of this tasking<sup>4</sup> provided a comprehensive review of NSQIP and resulted in several recommendations to incorporate NSQIP into the MHS direct care quality systems. From this review, the Board provided the following recommendations:

#### **Recommendation 2:**<sup>4</sup>

- A) The MHS quality program must continue to use a quality assessment model that leverages risk-adjusted data, such as NSQIP, to focus on patient outcomes by institution and across the MHS.
- B) MHS leaders must regularly demonstrate that quality improvement and high reliability are valued at all levels of the MHS through openness to identify and address problems,



engagement by surgical programs in professional society verification activities, and participation in inter-institutional collaborative to share best practices.

- a. The MHS quality program must continue to focus on a performance improvement model that leverages risk-adjusted NSQIP data, patient outcomes, and partnerships.
  - b. Regulation and policy barriers for confidentiality of patient safety and quality assurance records, such as *10 U.S.C. 1102* and associated policies must be modified so that safety and quality information cannot be used in a punitive way with regard to individuals, as it hinders open discussions of issues. The VHA has employed this non-punitive approach as facilitated by *38 U.S.C. 5705* and associated policies to ensure similar protection against punitive use of safety and quality data is mandated by the *Patient Safety and Quality Improvement Act of 2005*. Following the recommendations of *Optimal Resources for Surgical Quality and Safety* by the ACS, the most effective surgical quality-improvement leaders seek to establish a culture where quality improvement and high reliability are valued and requires an explicit infrastructure including policies and procedures that facilitate the achievement of this goal that are built on accountability and fairness for all team members and encourages open and honest discussions of vulnerabilities and problems.
- C) The MHS must adopt a continuously learning healthcare system within the MHS to facilitate the improvement of patient safety and quality.
- a. A comprehensive view of quality includes NSQIP data, registries and databases derived from electronic health records (EHR), identification of adverse events and care vulnerabilities through the DoD PSP, peer-review programs, and ongoing system analysis.

#### **Recommendation 4:**<sup>4</sup>

- A) The DoD must standardize policy and practice regarding use of NSQIP results across the system.
- B) The MHS must empower MTF NSQIP leaders to act upon outcomes in conjunction with MHS NSQIP collaboratives.
- C) The MHS must support MTF participation in national risk-adjusted registries such as, but not limited to, MBSAQIP and TQIP.
- D) Coding must be resourced for improvement in accuracy. Training must be standardized across the MHS to ensure reporting based on CPT codes is as accurate as possible.
- E) The MHS must continue to optimize its IT infrastructure and analytics support, including MHS GENESIS and the MHS Management Analysis and Reporting Tool (M2).

This section provides an overview of NSQIP from the first part of this taking. See Defense Health Board, 2018, *Low-Volume High-Risk Surgical Procedures: Surgical Volume and Its Relationship to Patient Safety and Quality of Care*<sup>4</sup> for more information.

The ACS NSQIP is a “nationally validated, risk-adjusted, outcomes-based program to measure and improve quality of surgical care.”<sup>48</sup> It was created by surgeons for surgeons and provides participating hospitals with tools, analyses, and reports to make informed decisions about improving quality of care.<sup>48</sup> The goal of NSQIP is to measure and improve the quality of surgical care and provide facility-based assessments of surgical outcomes.<sup>45,46</sup>



The ACS NSQIP includes over 700 participating hospitals within the government and civilian sectors.<sup>45</sup> Understanding NSQIP's value, the Defense Health Agency (DHA) *Procedural Instruction (PI) 6025.01 Implementing the ACS NSQIP Across the MHS*<sup>141</sup> assigns responsibilities and establishes uniform guidelines, standards, and procedures for all DoD MTFs providing health care services in the direct care system to comply with the final report to the Secretary of Defense, *Military Health System Review 2014*,<sup>125</sup> and *NDAA FY 2015 Section 713 Expansion of evaluation of effectiveness of TRICARE program to include information on patient safety, quality of care, and access to care at military medical treatment facilities*,<sup>52</sup> directs the implementation of the surgical quality and reporting guidelines developed by ACS NSQIP.<sup>142</sup>

Since its inception, NSQIP has quickly expanded across the MHS from 17 participating MTFs in 2014, to all 48 inpatient MTFs in 2018.<sup>45,46</sup> The NSQIP statistical models within the MHS use CPT codes, length of operation, and 30-day post-operation status.<sup>45,46</sup> A NSQIP facility team includes a surgical case reviewer (SCR) (generally 1.0 full-time equivalent [FTE]; varies by program selection/surgical volume) and a surgeon champion (approximately 0.1 FTE; varies).<sup>45,46</sup> Within the MHS, SCRs are registered nurses (RNs); other clinical reviewers may include physician assistants (PAs) or nurse practitioners (NPs).<sup>45,46</sup> All clinical reviewers complete a one-month training for certification with annual certification renewal requirements.<sup>45</sup>

Within NSQIP, there are three sampling options to obtain data: 1) NSQIP Adult Program: Essential (General/Vascular and Multispecialty); 2) Targeted Procedure (DoD uses and is MTF specific); and 3) Small Rural (annual surgical volume less than 1,680).<sup>45,46</sup> Essentials Targeted Procedures may not capture 100% of surgical volume, dependent upon SCR resources.<sup>45,46</sup> One full time equivalent (FTE) will abstract 1,680 cases annually.<sup>45,46</sup> CPT codes are critical components of inclusion criteria for sampling.<sup>45</sup>

As shown in Figure 5, the overall impact of NSQIP has been positive over time, from its use in the first MTFs in January 2015 to its use in all 48 surgical inpatient MTFs in July 2018.<sup>46</sup> Specifically, Figure 5 illustrates the impact of increased NSQIP engagement within facilities and between facility leaders, through the NSQIP collaborative, with case morbidity outliers and variation decreasing and median odds ratio progressively moving below 1.0, reducing the odds of patient risk.<sup>46</sup>





contingent on the surgeons' active participation in shared learning and quality analysis as well as robust facility support (personnel, informatics, and budgetary) for quality improvement.<sup>46,143</sup>

## AMERICAN COLLEGE OF SURGEONS ADVISORY COUNCIL FOR RURAL SURGERY

The ACS Advisory Council for Rural Surgery (ACRS) was established in 2012 with the mission “to identify, investigate, and rectify the challenges of rural surgical practice.”<sup>144</sup> The ACS ACRS focuses on development of broad-based training and rural residency tracks as well as focused support for rural surgeons, including recruitment, retention, mentoring, and post-residency education.<sup>144</sup>

There are approximately 60 million people in the rural United States who have access to fewer physicians per capita and 20-30 percent less overall medical services, compared to the non-rural population.<sup>38</sup> Approximately 7 percent of General Surgeons care for 25 percent of this population leading to large areas of “surgical deserts,” specifically in the Midwest, with little or no surgical coverage and many vacant General Surgery positions.<sup>38</sup> Rural trauma care is an area of concern with only 24 percent of the rural population (compared to 95 percent of the urban population) residing within one hour of a Level I or Level II Trauma Center.<sup>38</sup>

The ACS ACRS defines a rural surgeon as providing surgical care to a community of 50,000 people or less and a catchment area of up to 100,000 people.<sup>38</sup> Rural surgeons, like some military surgeons, face barriers when operating in remote areas including: lack of resources and time to collect, measure, and compare data; a limited number of cases for measuring outcomes; limited technology and scarce resources; and a lack of specialty support.<sup>38</sup> The ACS ACRS aims to alleviate some of these rural surgeon challenges.<sup>38</sup>

Rural surgeons are also vulnerable to volume-based approaches to quality, such as the Volume Pledge.<sup>38</sup> Rural surgeons perform a wide array of procedures many of which are in relatively low numbers.<sup>38</sup> The Volume Pledge supports the regionalization of certain procedures; however, regionalization is often overlooked in the “value of care” equation.<sup>38</sup> There are many hidden costs to regionalization, including costs of travel, meals and lodging for family members, and reduced social support.<sup>38</sup> Local surgical care may optimize quality through timely, patient-centered, efficient, and equitable care.<sup>38</sup> The Volume Pledge hinders rural surgery by limiting the scope of practice and further compounding negative effects from regionalization.<sup>38</sup> Instead of focusing on volume, the ACS ACRS promotes safety and efficacy as quality of care benchmarks.<sup>38</sup> Specifically for rural surgeons, there must be continued efforts to improve the system of measuring, documenting, and reporting to ensure quality care.<sup>38</sup> Outcomes must be compared with benchmarked national data, which are readily available even if a facility is not a member of the ACS NSQIP, as this is an expensive program that also requires additional support services.<sup>38</sup>

Furthermore, the ACS ACRS highlights the importance of robust quality programs such as the ACS *Optimal Resources* and the ACS NSQIP Surgical Risk Calculator which are useful especially for rural facilities that may not be able to bear the financial burden of NSQIP.<sup>38</sup> The Risk Calculator is a key resource for analyzing a patient's risk based on underlying medical conditions for a specific procedure and assists with patient decision-making.<sup>44</sup> It “provides an



accurate and customized assessment of the morbidity and mortality risk associated with specific procedures and may be a useful guide in the discussion leading up to the provision of informed consent.<sup>44, p.29</sup> NSQIP offers the Small and Rural Programs opportunities to meet the needs of rural hospitals with lower volumes and limited resources, with 44 participating hospitals in 2015.<sup>44</sup>

Current ACS ACRS initiatives include:

- (1) Offering an annual rural surgery skills course;
- (2) Developing a definitive list of rural surgery training programs;
- (3) Developing the essential components of a rural surgery training program;
- (4) Identifying new rural training programs and more rural rotations;
- (5) Developing verification/recognition of quality and safety programs for rural hospitals; and
- (6) Developing a surgeon-led system for rural surgical locums.<sup>38</sup>

The verification/validation/recognition program of quality and safety programs for rural hospitals is a joint effort between ACS leadership and the ACS ACRS modeled from the *Optimal Resources* model and adjusted specifically for small/rural hospitals.<sup>38,59</sup> A pilot program is tentatively scheduled for summer of 2019.<sup>38</sup> Remote MTFs face the challenges of maintenance of skills and infrastructure management, similar to civilian rural surgeons, and may benefit from involvement in the small/rural hospital pilot program.

Collegiality, mentorship, and surgical rotations are vital practices for rural surgeons, including those in the military. When a junior surgeon has a senior surgeon mentor, satisfaction and retention rates increase.<sup>126</sup> The Gunderson Health System in Wisconsin has formal and informal affiliation and collegiality between surgeons in multiple smaller hospitals and one large hospital within the system.<sup>38</sup> It is important for surgeons to have courtesy privileges at both hospitals for successful rotations, which is implemented in Kalispell, Montana where a surgeon from a small hospital is able to assist at a larger hospital and vice versa.<sup>38</sup> Additionally, surgeon mentorship programs benefit both the mentor and mentee; thus, implementation of a mentoring program within the military with either civilian or military surgeons may be advantageous.<sup>126</sup>

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Surgical rotations are an expanding focus area of the ACS ACRS. Many military surgeons face the same challenges as rural surgeons. These challenges, such as individual and team skill maintenance, may be mitigated by focusing on an integrated, community-oriented approach with surgeon rotations across facilities, including civilian and academic centers.<sup>38,143</sup> Surgical experience is critical for skill maintenance; a surgeon who previously worked in a high-volume facility can maintain skills in a low-volume facility due to his/her accumulated experience and case mix.<sup>127</sup> The ACS ACRS is exploring expanding the surgeon rotation concept to include MTFs and military medical personnel.<sup>38</sup> This would be especially beneficial for locations such as Georgia where the Trauma Centers are in urban areas, but the MTFs are in rural locations.<sup>38</sup>



Expansion of military-civilian partnerships for surgical rotations to also include academic centers as well as infrastructure and resource sharing may be mutually beneficial.<sup>38</sup> For example, a surgeon from a large academic center can assist a rural surgeon with a complex case in order to keep the patient in the community hospital.<sup>38</sup> Moreover, surgeon rotations that involve the entire surgical team are essential for learning and team-skill maintenance; this would be achieved through assisting in a higher volume facility's operating room.<sup>38</sup>

The ACS ACRS initiatives and programs provide potentially adoptable models for the MHS, specifically with regard to a surgical quality program that understands the critical challenges of adopting volume thresholds and the importance of skill maintenance for surgeons and surgical teams through rotations. Since many MTFs are located in rural/remote areas, the challenges and opportunities the ACS ACRS has developed may be adaptable to military populations who face the same challenges due to operational locations. There are also opportunities for furthering civilian-military partnerships specifically for rural military and civilian surgeons and for MTFs to participate in the small hospital quality verification/validation program.

### BLUEPRINT GUIDELINES FOR MILITARY-CIVILIAN PARTNERSHIPS IN TRAINING, SUSTAINING, RETENTION, AND READINESS

The goal of the Military Health System Strategic Partnership with the American College of Surgeons (MHSSPACS) is “to improve educational opportunities, systems-based practices, and research capabilities in surgery.”<sup>66</sup> The strategic partnership began in 2014 as a collaboration to exchange information between the ACS and MHS for improvement and advancement of high-quality, cost-effective surgical care.<sup>59,66</sup> The partnership environment ensures that the military health care system operates in collaboration with civilian models of excellence while also sharing its own best practices.<sup>145</sup> The early MHSSPACS quality initiative was to enroll all MTFs into the ACS NSQIP program, which was accomplished in 2018.<sup>59,145</sup> This effort has continued after accomplishing the initial goal with the formation of a military NSQIP consortium, allowing MTFs to share best practices and lessons learned throughout the enterprise.<sup>145</sup>

Another leading effort of the MHSSPACS is the Combat Casualty Care (C3) Knowledge, Skills, and Abilities (KSA) clinical readiness project created as a method of measuring return on readiness for deployment for an expeditionary general surgeon (i.e. readiness of the MHS medical force).<sup>145</sup> Based on the experience of war, Joint Trauma System (JTS) Clinical Practice Guidelines (CPGs), case registries, and relevant literature, the KSA formulation addresses the return on readiness for a variety of routine surgical care procedures, a methodology not previously developed.<sup>107,146</sup> Specifically, KSAs are mapped to relevant CPT codes in surgeons' current workloads.<sup>107</sup> These KSAs identify and capture specific parts of the procedures that give readiness volume.<sup>107</sup> A readiness value is given for every procedure with more complex procedures yielding a higher KSA value.<sup>107</sup> Thresholds are developed based on diversity, volume, and acuity.<sup>107</sup>

In the first part of this tasking,<sup>4</sup> the Board recommended the following regarding the KSA program:

**Recommendation 5:**<sup>4</sup>

The KSA program must be supported to validate its role in maintaining surgical readiness. The roles of telemedicine, telepresence, and telesurgery with specialists to fill KSA gaps must be explored.

See Appendix B for more information on the KSAs.

The MHSSPACS also assists in defining the gaps in Combat Casualty Care (CCC) research that are appropriate for investigation in civilian centers. The re-birth of the Excelsior Surgical Society, a society of military surgeons now permanently housed within the ACS, allows for the exchange of information and research of relevance to military surgeons.<sup>145</sup>

Another major area of the MHSSPACS is the standardization of military-civilian partnership guidelines. In the early 2000s, the U.S. military established five major partnerships with academic trauma centers in order to provide surgeons and surgical teams opportunities to train and maintain trauma skills when not deployed.<sup>67</sup> These original five include Ryder Army Training Center (University of Miami), the Navy Trauma Training Center (University of Southern California), Los Angeles County, and three Air Force Centers (Center for Sustainment of Trauma and Readiness Skills [C-STARS]) at St. Louis University, the University of Cincinnati, and the Shock-Trauma Center at the University of Maryland.<sup>67</sup> These five platforms differ in their structure with regard to the number of cadre (more permanent medical staff versus rotators), the training that they offer, the number and types of rotations provided, and their mission-specific focus.<sup>67</sup> In addition to these original five platforms, other military-civilian partnerships have been developed in geographic areas where military bases are in proximity to major academic trauma centers, such as San Antonio TX, Sacramento CA, Wright-Patterson, OH, and Las Vegas, NV.<sup>67</sup>

The *NDAA FY 2017 Section 708* provides for the establishment of a Joint Trauma Education and Training Directorate to ensure that the trauma providers of the Armed Forces maintain readiness for rapid deployment in future conflicts.<sup>52,67</sup> It also provides for establishment of additional military-civilian partnerships designed to maintain professional competency for military medical personnel.<sup>52,67</sup> These partnerships will be funded through the Mission Zero Act that has already passed through the House and is currently under consideration in the Senate as part of the Pandemic and All Hazards Preparedness and Advancing Innovation Act.<sup>67,147</sup> Although the number of additional training platforms needed by the U.S. military has not been established, and how the already established partnerships will be handled when this new grant funding becomes available are unknown, the MHSSPACS is leading the efforts to set the standards by which all military-civilian partnerships will be chosen, validated, and evaluated.<sup>67</sup> These guidelines (i.e. the “Blue Book”) are currently under construction but are anticipated to be completed by June 2019 and will be formalized in a publication that is modeled after ACS standard-setting documents such as those used to verify trauma centers, pediatric surgical care, bariatric and cancer centers, and patient safety initiatives.<sup>67</sup> The “Blue Book” will include seven chapters as summarized below.

- (1) *Goals and Objectives.* This chapter will provide an overview for the development of these partnerships and include a description of the ACS Generic Standards for developing, and



collecting data, and verifying that the standards are met. These generic standards include the following nine items:

- Institutional Administrative Commitment
- Program Scope and Governance
- Facilities and Equipment Resources
- Personnel and Services Resources
- Patient Care: Expectations and Protocols
- Data systems and Surveillance
- Quality Improvement
- Research: Basic and Clinical
- Education: Professional and Community Outreach<sup>67</sup>

(2) *The Clinical Readiness Program.* The Clinical Readiness Initiative was established in 2016 and is a joint effort between the DHA and the Uniformed Services University of the Health Sciences (USUHS). Over the past two years, the team has developed eight critical wartime specialties, with approximately 3,790 KSAs; eight additional KSAs are expected to be implemented in June 2019.<sup>62</sup> See Appendix B for more information on the KSAs. Through periodic evaluation of these knowledge points and trauma skills, combined with rotations through military-civilian trauma platforms, a continuously ready military force can be assured.<sup>67</sup>

(3) *Partnership Models.* This chapter will first focus on the extensive history of military-civilian partnerships, beginning with the American Red Cross designated academic teaching facilities in 1917. It will include the Strategic Partnerships Models developed in 2001-2003 of the first five centers, as described in Chapter 1, and it will then describe four different types of partnerships to include:

- Type 1: A platform with full-time embedded cadre serving as year-round providers/instructors/faculty with additional rotating trainees.
- Type 2: A platform with full-time embedded cadres serving as year-round providers/faculty but no regular rotations for other trainees/teams.
- Type 3: A platform that can accommodate intermittent rotations by military providers who sustain their readiness requirements by working with the faculty on an intermittent basis.
- Type 4: A platform that provides for other enlisted personnel, technicians, corpsmen, etc. to sustain their skills (such as Army's Strategic Medical Asset Readiness Training [SMART] program).<sup>67</sup>

This chapter will also include standard language for a Training Affiliation Agreement (TAA)/Memorandum of Understanding (MOU) that defines the roles and responsibilities of both the civilian institution and the military. The necessary equipment needed for partnerships as well as professional billing, liability, and other fiscal considerations as encountered by the original training platforms will also be included.<sup>67</sup>

(4) *Partnership Objective and General Characteristics.* This chapter will focus on the importance of clearly defining the objectives when establishing trauma training partnerships and will include a discussion of the objectives from both military and civilian partnerships.

- Objectives for the civilian trauma center:
  - (a) Incorporate military lessons learned and military mentality



(b) Identify military research needs in order to better meet military research requirements

- Objectives for military trauma practitioners:
  - (a) Training (requires direct supervision)
  - (b) Re-training (direct and indirect supervision)
  - (c) Sustainment: embedded full-time versus part-time military personnel; faculty positions for full-time

Also included in this chapters is a discussion of various models for embedded military personnel from other disciplines outside of surgery (emergency medicine, anesthesia, etc.) and some of the difficulties with various models due to limited clinical opportunities, Graduate Medical Education (GME) conflicts, etc.<sup>67</sup>

- (5) *Selection Criteria.* When applying for verification by an independent civilian organization (most likely by the MHSSPACS), a military-civilian partnership wishing to be funded through the Mission Zero grant process will be evaluated on the following criteria:
- Specific clinical exposure criteria: total trauma patient volume; proportion of penetrating injuries; ability to provide exposure to meet the KSA for each discipline; sufficient volume for in-depth exposure to critically ill patients (such as high injury severity score [ISS]); experience with receiving “un-prepped trauma” delivered by non-EMS means; experience with multi-casualty events.
  - Other factors for consideration: the presences of a highly functioning trauma program with patient continuity of care/coordinated team approach; exposure to surgical specialties (vascular, neurosurgery, orthopedics, etc.) access to emergency general surgery cases, provision of mentorship and autonomy, and surgical research.
  - A robust educational component to include didactic and skills-based education and training; presence of an ACS Accredited Educational Institute (AEI); provision of a broad range of ACS courses such as Advanced Trauma Life Support (ATLS®), Advanced Surgical Skills for Exposure in Trauma (ASSET®), ultrasound, Trauma Nursing Core Course (TNCC), Basic Endovascular Skills for Trauma (BEST), etc.; trauma case conferences and educational rounds; performance improvement and trauma system management conferences.<sup>67</sup>
- (6) *Performance Evaluation.* Based on the extensive experience with trauma consultation and verification at the ACS/Committee on Trauma (COT) the following processes will be described:
- Performance evaluation program
  - Consultation
  - Verification
  - Outcomes of Verification (pass/fail/provisional)
  - Type 1 and Type 2 criteria
  - Multidisciplinary review
  - Site visit process
  - Appeals process
  - Verification Performance Improvement Process
  - Application forms and site visit information
  - Supplemental reading

It is anticipated that each Military-Civilian Partnership Program being funded through Mission Zero will be re-evaluated on a yearly basis using the following criteria:



- Overall program/program support
  - Individual and team trauma education and clinical experience
  - 360° evaluation of all participants
  - Ability to meet KSA goals
  - Application of military clinical practice guidelines (CPGs) in the civilian trauma setting<sup>67</sup>
- (7) *Value of Partnerships.* The final chapter will be based on the overall value of such partnerships to the military and vice-versa in the short-term and long-term as well as potential solutions to shared problems such as billing issues with military providers; malpractice, and portability of licenses for military personnel rotating through civilian centers.

The Grid: This is the check-mark evaluation tool to be used in the verification process. Some items will be deemed essential (such as the presence of a trauma team) and others will be deemed desirable (such as exposure to basic science research) depending upon what type of partnership is being evaluated. It is anticipated that verification visits will be coordinated through the MHSSPACS in collaboration with the Joint Trauma Education and Training Directorate at the DHA. As with the ACS/COT Verification Process, those individuals who participate in site visits will be required to undergo specific training prior to his/her initial verification visit.<sup>67</sup>

## D.5 THE MILITARY HEALTH SYSTEM AND LEAPFROG GROUP INITIATIVE

In 2018, the MHS announced its new partnership with The Leapfrog Group.<sup>61</sup> Leapfrog has three primary programs. The Leapfrog Hospital Survey is a free, voluntary survey on safety and quality completed by participating hospitals annually that allows hospitals to benchmark their progress in improving the safety, quality, and efficiency of care delivered.<sup>60,61</sup> The Leapfrog Hospital Grade focuses exclusively on hospital safety.<sup>148</sup> The Leapfrog Value-Based Purchasing Program, using data from the Leapfrog Hospital Survey, provides information to large purchasers to identify the highest value hospitals in individual markets and across the country.<sup>148</sup>

Like the Volume Pledge, Leapfrog's Surgical Volume Standards identify annual hospital and surgeon volume thresholds for "low-volume high-risk" surgical procedures. Leapfrog's volume thresholds were developed with a contract with the Armstrong Institute of Patient Safety and Quality at Johns Hopkins Medicine and a voluntary national expert panel.<sup>iii,61</sup> Of note, in 2018, Leapfrog removed hip and knee replacement procedures from its list of "low-volume high-risk" surgical procedures.<sup>61</sup> Additionally, volume thresholds are different for Leapfrog, compared to the original Volume Pledge, with Leapfrog higher for hospital volume for four of the eight procedures and four for surgeon volume.<sup>8,61</sup>

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<sup>iii</sup> Expert panel: Michael Belkin, MD, Brigham and Women's Hospital; Conor Delaney, MD, MCh, PhD, FACS, FRCSI, FASCRS, Cleveland Clinic Lerner School of Medicine; Justin Dimick, MD, MPH, University of Michigan Health System (Chair); Andrew Ibrahim, MD, MSc, University of Michigan; David S. Jevsevar, MD, MBA, Dartmouth-Hitchcock Medical Center; Christine Lau, MD, University of Virginia; Timothy M. Pawlik, MD, MPH, PhD, Ohio State University; Wexner Medical Center; Richard Shemin, MD, Ronald Reagan UCLA Medical Center; Dana A. Telem, MD, MPH, FACS, FASMBS, University of Michigan



**Table 9.** Leapfrog’s 2018 Surgical Volume Standards<sup>61</sup> Compared to the 2015 Surgical Volume Pledge Volume Thresholds<sup>8</sup>

	Procedure	Leapfrog Hospital Volume/Year	Volume Pledge Hospital Volume/Year	Leapfrog Surgeon Volume/Year	Volume Pledge Surgeon Volume/Year
	Bariatric surgery	50	40	20	20
Cancer resections	Esophagus	20	20	7	5
	Lung	40	40	15	20
	Pancreas	20	20	10	5
	Rectum	16	15	6	6
	Carotid arterial stenting	20	10	10	5
Cardio-vascular	Complex aortic surgery	15	20	10	8
	Mitral valve repair	40	20	20	10
Orthopedics	Hip replacement	Not included	50	Not included	25
	Knee replacement	Not included	50	Not included	25

The MHS currently reports Leapfrog Hospital Survey data for WRNMMC, including surgical volume data.<sup>149</sup> WRNMMC does not yet supply enough data to enable a Leapfrog Hospital Grade in overall hospital safety, but may in the future.<sup>149</sup> Leapfrog’s Surgical Volume Standards for annual surgeon volume state that the privileging process must include the minimum surgeon volume thresholds.<sup>60</sup> However, the DoD does not privilege based on volume.<sup>60</sup>

In addition to surgical volumes, the Leapfrog Hospital Survey covers nine sections: basic hospital information, medication safety, inpatient survey, maternity care, intensive care unit (ICU) physician staffing, National Quality Forum (NQF) safe practices, managing serious errors, medication safety, and pediatric care.<sup>60</sup> Public reporting of the survey data is displayed in the following categories:

- Inpatient care management (steps to avoid, never events management, appropriate use of antibiotics in hospitals, specially trained doctors care for ICU patients),
- Medication safety (doctors order medications through a computer, safe medication administration, medication reconciliation),
- Infections (infection in the blood, infections in the urinary tract, methicillin-resistant Staphylococcus aureus (MRSA) infection, C. diff infection, surgical site infection after colon surgery),
- High-risk surgery (bariatric surgery for weight loss, carotid artery surgery, mitral valve repair and replacement, open abdominal aortic aneurysm repair),
- Cancer surgery (lung resection, esophageal resection, pancreatic resection, rectal cancer surgery),
- Maternity care (early elective deliveries, cesarean section, episiotomies, maternity care processes, high-risk deliveries),
- Pediatric care (experience of children and their parents, radiation dose for head scans, radiation dose for abdomen/pelvis scans).<sup>150</sup>



Leapfrog offers an avenue for demonstrating transparency around a specific grouping of indicators, some quantitative but most qualitative.<sup>60</sup> The survey assesses:

- Organization-wide approach to patient safety and quality, to include proactive engagement with patient safety and quality, nursing practices, never events management, and risk management from the executive leadership level to the bedside based upon NQF recommendations, along with additional input from an expert panel within each area of focus.<sup>60</sup>
- Specifically to surgery, Leapfrog's strong focus on volume of eight specific procedures limits its applicability to military surgery, as these eight procedures do not encompass the breadth of complex surgical care provided in the military health care environment. The focus on volume equating to beneficial surgical outcomes is also controversial and ignores demonstrably good outcomes in the MHS.<sup>60</sup>

Beyond inpatient surgery, Leapfrog provides broad assessment of inpatient care quality across an organization, with resultant potential to positively impact surgical outcomes.<sup>60</sup> MHS participation in the annual Leapfrog survey is scheduled to expand to additional MTFs that are now under DHA administration and management.<sup>60,149</sup> To mitigate the challenges of data extraction, the DHA is moving toward centralizing data collection at the enterprise level as opposed to individual MTFs.<sup>60</sup> Moreover, as more MTFs begin the Leapfrog Survey cycle, the DHA plans to provide personnel at each facility to manage the information required for submission.<sup>60</sup> WRNMMC feels that this Leapfrog effort has overall been a very helpful and insightful process.

According to the DHA Director, "Participation in Leapfrog enhances MHS' transparency, standardization, quality, and safety. This and other ongoing initiatives catalyze the development of an integrated system of readiness and health that is predicated on achieving meaningful outcomes and participating in quality verification programs."<sup>151</sup> Further, MHS participation in Leapfrog has the potential to complement MHS efforts in maturing a disciplined management cycle through the Quadruple Aim Performance Plan (QPP), resourcing strategic priorities, and evaluating program success.<sup>53</sup> A standardized process to capture improvement work has been established by DHA's Office of Strategy Management/Performance Improvement, which plans to enhance the ability to learn from previous efforts.<sup>53</sup> Integration of readiness and health includes looking at patients across all MHS environments of care, and determining meaningful outcome measures for direct and purchased care by leveraging partnerships with national quality organizations and participation in national professional quality improvement programs.<sup>53</sup>

## D.6 OBSERVATIONS

As explained in *Crossing the Quality Chasm*, reducing risk and ensuring safety requires greater attention to robust systems that assist in preventing and mitigating errors.<sup>152</sup> Thus, this system for high quality of care requires standardized, evidence-based guidelines such as the ACS *Optimal Resources for Surgical Quality and Safety*. Volume alone is not a sufficient measure of surgical quality.<sup>15,16,36,43,59,102,126,153</sup>

The following observations are made:



- (1) Only the three original Volume Pledge institutions (Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and University of Michigan Health System) have joined the initiative. Practices within these three academic institutions did not vastly change because they are already large facilities performing surgeries in high numbers. Other high-quality institutions, including Kaiser Permanente, Mayo Clinic, and MGH have not joined the Volume Pledge and do not emphasize volume as an indicator of quality.
- (2) There is limited outcomes data and peer reviewed, Volume Pledge-focused literature from any of the three institutions that agreed to the initiative.
- (3) The Volume Pledge disproportionately benefits academic medical institutions. Although academic centers may have better outcomes, they are also more expensive for patients and may have longer wait times for certain procedures.
- (4) The Volume Pledge's 10 "low-volume high-risk" surgical procedures are selective, elective, complex, and based on the civilian population. None of the procedures are emergent nor do they reflect the high-intensity military surgical environment. The 10 procedures were selected by roundtable consensus from only the three institutions who signed onto the initiative.
- (5) Directly applying the civilian Volume Pledge initiative to the military environment may be problematic due to MHS population differences and mission requirements, such as rural/remote locations of MTFs and deployment requirements.
- (6) Surgical volume is an imperfect surrogate measure of surgical quality.
- (7) The VHA facility infrastructure model (VHA Directive 2010-018<sup>39</sup>) is a sophisticated approach to surgical quality that does not rely on volume alone. It considers the infrastructure, medical team, and overall personnel training and competence. Other quality organizations, including the ACS, have acknowledged the importance of this model for patient safety and quality.<sup>59</sup>
- (8) When applying the VHA facility infrastructure directives to the 10 "low-volume high-risk" surgical procedures, only five of the 10 procedures are considered "complex."
- (9) Examination of civilian organizations with demonstrated high-quality of care programs shows the importance of having sufficient infrastructure to examine outcomes and conduct performance improvement plans if complications occur.
- (10) The Board previously recommended a surgeon rotation system for surgeons and surgical teams,<sup>4</sup> like that of Mayo Clinic. Further assessment of successful civilian surgical rotation efforts may help the DoD in development of these critical civilian-military partnerships.
- (11) The ACS Surgical Quality Verification program has been tested at four facilities, including one MTF–WRNMMC. It provides a manual to guide facilities in creating a programmatic approach toward surgical quality.
- (12) The ACS verification/validation program for small hospitals appears promising as it addresses the specific concerns of adopting a quality program at small facilities. As many MTFs operate in rural/remote areas, further consideration of the applicability of this model within the DoD may be useful.
- (13) The ACS ACRS identified many initiatives and programs for civilian rural surgeons that align with the challenges and opportunities for military surgeons operating in rural/remote MTFs. These opportunities include surgeon and team rotations and an ACS quality program modeled from *Optimal Resources* with considerations for the rural surgical environment.



- (14) Participation in the Leapfrog Annual Survey provides opportunities for transparency, objective benchmarking of performance against civilian institutions, internal process improvement, and standardized quality and safety data. Surgical volume is reported as one of the seven publicly reported data sections.



## APPENDIX E. HOSPITAL QUALITY TOOLS AND RATING AND RANKING SYSTEMS: THE EFFECT ON QUALITY OF CARE

### E.1 INTRODUCTION

Outcomes information, captured through data-driven tools, is important for patient decision-making and hospital quality improvement.<sup>154</sup> However, there are vast methodology differences among popular quality assessment tools, as well as many consumer-directed hospital rating and ranking systems.<sup>155</sup> These systems differ in their rating focus, hospital eligibility, performance measures, use of risk adjusted outcomes, methodology, communication of ratings, and funding.<sup>155</sup> Moreover, only some systems specifically address surgical outcomes whereas others focus on overall patient safety and quality ratings.

The relationship between various quality tools and assessment systems and quality of care is unclear. This appendix examines some of the most popular hospital quality rating and ranking systems to assess system methodology and comparison to one another and if, and to what extent, participation in a hospital quality rating or ranking system impacts (i.e. improves) quality of care and patient safety. The latter part of this appendix examines various hospital tools to identify how best to measure quality and outcomes.

### E.2 OVERVIEW OF HOSPITAL QUALITY RATING AND RANKING SYSTEMS: THE EFFECT ON QUALITY OF CARE

Nationally recognized surgical quality measurement programs share a common goal of increasing transparency, but differ in assessment methods and transparency levels. Methodology may be tailored to the intended audience (i.e. a medical facility focused on performance improvement, individual patients focused on health care decisions, or industry payors assessing the value of care provided). Table 10 provides a comparison of the rating and ranking systems covered in this section.

#### CENTERS FOR MEDICARE AND MEDICAID SERVICES HOSPITAL COMPARE

The Centers for Medicare and Medicaid Services (CMS) Hospital Compare is a publically available tool that offers overall ratings for hospital facilities using a five-star rating system.<sup>156</sup> It has quality of care information for over 4,000 Medicare-certified hospitals, including over 130 Veterans Administration (VA) medical centers, all civilian facilities in the TRICARE network, as well as military medical treatment facilities (MTFs).<sup>157,158</sup> Hospital Compare includes 124 measures in the following groups: mortality, safety of care, readmission, patient experience, effectiveness of care, timeliness of care, and efficient use of imaging.<sup>157</sup> It also provides information about payment and value of care including Medicare spending per beneficiary, payment measures and value of care for heart attack, heart failure, pneumonia, and hip and/or knee replacement patients.<sup>157</sup>

In January 2019, the American College of Surgeons (ACS) partnered with CMS to allow hospitals to report National Surgical Quality Improvement Program (NSQIP) outcomes to Hospital Compare.<sup>159</sup> Specifically, this partnership enables hospitals participating in the ACS



NSQIP Adult Program Options to publicly report on one or any combination of three National Quality Forum (NQF)-endorsed measures, including elderly surgery, colon surgical, and lower-extremity bypass outcomes.<sup>159</sup> Hospital Compare includes NSQIP details, including risk-adjusted outcomes information, to better support patients in making fully-informed decisions about their surgical care. See Appendix D for more information on NSQIP.

To assess overall hospital performance, Hospital Compare methodology combines results for several publically reported quality measures.<sup>160</sup> Hospital Compare uses Latent Variable Modeling (LVM), a statistical modeling approach that accounts for the correlation between quality indicators for a single hospital.<sup>iv,160</sup> This tool adjusts for the risk factors of the patients treated, but not for differences related to the quality of care.<sup>160</sup> Scores are reported on a 5 star rating scale.<sup>160</sup> It is an internally validated model using confirmatory factor analysis, stakeholder consultation, and k-means clustering.<sup>160</sup> Statistically significant differences in many of the groups were found between star ratings.<sup>160</sup>

In 2019, the American Hospital Association (AHA) raised concerns regarding Hospital Compare, including failure to include social determinants of health, accounting for differences in case type availability to institutions (e.g. academic centers are more likely to care for complex patients compared to smaller facilities), and the use of the LVM method for this kind of assessment.<sup>161</sup> These issues contribute to confusion and misinterpretation of hospital scores among the public and inaccurate comparisons. In response, CMS has consulted with experts and stakeholders regarding improvements to the rating system, including modeling methodology and offering more granularity in scoring, such as providing specific ratings for procedures and quality areas.<sup>161</sup>

## CONSUMER REPORTS HOSPITAL SAFETY RATING

Consumer Reports uses data from CMS, the Centers for Disease Control and Prevention (CDC), state inpatient databases, and the AHA.<sup>162</sup> The Consumer Reports' hospital rating "includes measures of patient outcomes (avoiding infections, readmissions, avoiding mortality, and adverse events in surgical patients), patient experience (including communication about hospital discharge, communication about drug information, and other measures), and hospital practices (appropriate use of scanning and avoiding C-sections)."<sup>162, p.2</sup>

For the Consumer Reports Hospital Safety Score, five major categories are used: avoiding infections, avoiding readmission, communication about discharge and medications, appropriate use of screening, and avoiding mortality, each of which includes several components.<sup>162</sup> In addition to the variety of data sources, Consumer Reports enlists external reviewers to measure methodology and convert measures into ratings.<sup>162</sup> For this model, all categories are given equal weight in the overall score calculation.<sup>162</sup> To receive a Hospital Safety Score, the hospital must have met the minimum data thresholds for at least one variable in each of the categories.<sup>162</sup> The

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<sup>iv</sup> The LVM model assumes that each measure only contributes once to a group score, even if that measure affects more than one aspect of quality and not all measures have the same weight. The LVM method accounts for missing measure data by using all available information to generate a group score for the hospital. The model can also accommodate hospitals with varying amounts of data; however, it is difficult to replicate and scores difficult to estimate. The model sometimes requires assumptions with some model parameters, such as error structures.



avoiding infection category does not have a data threshold, but must have data for at least three variables (surgical site infections, catheter associated urinary tract infections, and central-line associated blood stream infections).<sup>162</sup> Consumer Reports uses different converted score methods for each of the categories, then takes the mean of these converted, standard scores using equal weights. The mean is then linearly converted to a 0.5-100.5 point scale.<sup>162</sup> One benefit of this model is that it uses minimum data thresholds to ensure that each category has some data to contribute.<sup>162</sup> The model adjusts for patient risk, a key step for ensuring patient outcome variation is controlled; however, each category is given equal weight, suggesting they contribute equally to quality.<sup>162</sup> In addition, this method is partially validated.<sup>162</sup> Of note, a 2015 study found that hospitals surveyed in the model had an overrepresentation of small hospitals (1-99 beds) in the Midwest among lower performing hospitals and nonteaching hospitals were overrepresented among high performing hospitals.<sup>155</sup>

Consumer Reports does not collect hospital data for the Hospital Safety Ratings, which may result in quality control issues.<sup>162</sup> Thus, this results in Consumer Reports' limited access to summarized results of data analysis, preventing primary validation or presentation of data in alternative ways.<sup>162</sup>

## LEAPFROG GROUP'S HOSPITAL SAFETY GRADE

The Leapfrog Group is a national, nonprofit organization founded in 2000 by large purchasers in response to the 1999 Institute of Medicine (IOM) report *To Err is Human*.<sup>163</sup> The organization collects and publically reports information about the safety and quality of inpatient hospital care.<sup>163</sup> The Leapfrog Hospital Safety Grade utilizes 28 national performance measures from CMS and by Leapfrog to generate a composite score representing the hospital's overall performance in keeping patients safe from preventable harm and medical errors.<sup>163</sup> Secondary data are also used from the AHA and the Maryland Health Care Commission.<sup>163</sup>

After all data are collected, a Hospital Safety Grade is calculated. Leapfrog converts hospital data into Z-scores to allow for standardization and comparison of individual measures with different scales.<sup>v,163</sup> The resulting scores are reported as a letter grade.<sup>163</sup>

With respect to surgical procedures, Leapfrog focuses on the procedural volume and review of appropriateness criteria for eight specific "low-volume high-risk" types of operations: carotid endarterectomy, mitral valve repair and replacement, open abdominal aortic aneurysm repair, lung resection for cancer, esophageal resection for cancer, pancreatic resection for cancer, rectal cancer surgery, and bariatric surgery for weight loss.<sup>61</sup> These eight are the same as the Volume Pledge; in 2018, Leapfrog removed hip and knee replacements from its list of "low-volume high-risk" surgical procedures.<sup>61</sup> Volume thresholds are different for Leapfrog, compared to the original Volume Pledge, with Leapfrog higher for hospital volume for four of the eight procedures and four for surgeon volume.<sup>8,61</sup> See Appendix D for more information. In addition,

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<sup>v</sup> A Z-score is calculated using the raw measure score from the hospital, the measure's national average, and the standard deviation of that measure. To calculate a hospital's numerical safety score, each process Z-score must be multiplied by the measures associated weight. Each outcome measure Z-score is multiplied by that measures weight and both weighted Z-scores are added together. This value is then added to three to ensure a positive distribution. In cases of missing data, the weight assigned to that measure is redistributed to other measures in the same domain.



through hospital-reported CDC National Healthcare Safety Network (NHSN) data, Leapfrog reports on the standardized incidence rate ratio for surgical site infection after colon surgery.<sup>60</sup>

A 2014 study found that Leapfrog’s approach discriminates between hospitals with “D” and “F” scores when 30-day mortality rates were assessed, but not hospitals with “A,” “B,” or “C” scores.<sup>164</sup> Furthermore, a 2015 study comparing four hospital rating systems, including Leapfrog Hospital Safety Grade, found that public hospitals were over-represented as “low-performing” hospitals, whereas private, nonprofit hospitals were underrepresented.<sup>155</sup> This study also concluded that Leapfrog over-represents hospitals that are members of a hospital system as higher-performing compared to lower-performing hospitals.<sup>155</sup>

### HEALTHGRADES: PATIENT SAFETY EXCELLENCE AWARD AND AMERICA’S BEST HOSPITALS

Healthgrades is a for-profit company that develops and markets quality and safety ratings of health care providers and has rated hospitals since 1998.<sup>155</sup> Two of its rankings are the Patient Safety Excellence Award and America’s Best Hospitals. These are popular among the consumer rating and ranking hospital systems. The Patient Safety Excellence Award “measures how well a hospital prevents injuries, infections, and other serious conditions based on 14 serious, potentially preventable adverse events.”<sup>165</sup> Healthgrades America’s Best Hospitals is based on clinical quality outcomes for 32 conditions and procedures.<sup>166</sup> Additionally, America’s Best Hospitals are divided into three lists—50 Best Hospitals (top 1%), 100 Best Hospitals (top 2%), and 250 Best Hospitals (top 5%, previously known as Distinguished Hospital Award for Clinical Excellence).<sup>166</sup> For both ratings, Healthgrades uses Medicare inpatient data and the Agency for Healthcare Research and Quality (AHRQ) 14 Patient Safety Indicators (PSIs).<sup>167,168</sup>

The Patient Safety Excellence Award is designed to evaluate safety and quality of care at hospitals. Thus, 13 of the 14 AHRQ PSIs use logistic regression to predict the odds of patient safety incidents that are likely to occur at a specific hospital based on the patients treated at that hospital.<sup>vi,167</sup> Results are reported as *better than expected* (performance was better than predicted and the difference was statistically significant), *as expected* (performance was as predicted and not statistically different), and *worse than expected* (the performance was worse than predicted and the difference was statistically significant.)<sup>167</sup> See Table 10 for a summary of Healthgrades Patient Safety Excellence Award.

The Healthgrades America’s Best Hospitals’ evaluation system uses a similar statistical methodology to the Patient Safety Excellence Award; however, it does not utilize the AHRQ PSIs. It is designed to recognize hospitals that “exhibit comprehensive high-quality care across clinical areas.”<sup>168, p.3</sup> Procedures and in-hospital complications are divided into 34 “cohorts” and

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<sup>vi</sup> Using logistic regression, statistically significant risk factors are identified and their relationship to the outcome is determined. After a hospital’s individual patient predicted values are determined, these values are added to calculate the hospital’s predicted outcome. Odds ratios, Z-statistic, model (factor) coefficient, and standard error are all calculated to determine hospital performance. To avoid missing data issues, if a hospital does not meet the data threshold, a rating is not calculated.



risk models are developed for each of them relative to the patient outcome.<sup>vii,168</sup> Once scoring is complete, hospitals are listed in descending order by score and top percentiles are determined.<sup>168</sup> Results are then reported as top percentiles (e.g. top 1%, top 5%) and grouped by state location.<sup>167</sup>

The Healthgrades Patient Safety Excellence Award is limited in its ability to distinguish individual hospitals from hospital groups. If a hospital reported to CMS under a single provider ID, data are analyzed by Healthgrades as a single unit; thus, this may include more than one hospital under the same ID. Additionally, according to a 2008 *Health Affairs* article, a high score from Healthgrades did not always correlate to hospital quality; one hospital was ranked highest by Healthgrades but had the second highest mortality rate in the survey.<sup>169</sup>

## U.S. NEWS AND WORLD REPORT BEST HOSPITALS LISTS

For more than 20 years, U.S. News & World Report has released its annual Best Hospitals lists.<sup>155</sup> The Best Hospitals program is a suite of more than two dozen sets of ratings and rankings covering a variety of surgical procedures, medical conditions, and complex specialty care.<sup>137</sup> It reviews hospitals' performance in adult and pediatric clinical specialties, procedures, and conditions with scores based on several factors including patient safety, survival, and nursing staff.<sup>137</sup> The Best Hospitals Honor Roll recognizes 20 hospitals with outstanding performance across multiple areas of care.<sup>137</sup> Hospitals are awarded points by being nationally ranked in 12 Best Hospital specialty rankings,<sup>viii</sup> or in four reputational specialty rankings,<sup>ix</sup> or by being ranked as high performing in the nine procedures and conditions. U.S. News uses hospital data from Medicare administrative data, Hospital Compare, the AHA annual survey, publically available clinical registry data, external designations, and post-discharge inpatient surveys.<sup>170</sup>

The U.S. News' rating and ranking systems cover a range of surgical procedures, medical conditions, and areas of complex specialty care.<sup>137</sup> For the Best Hospital ranking, goodness of fit statistics are assessed.<sup>x,171,172</sup> Results are ranked based on a score out of 480 and ordered from highest score to lowest.<sup>171</sup> The overall model was internally validated using a multi-trait matrix, which compares the relative correlations of ratings across cohorts.<sup>171</sup>

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<sup>vii</sup> Using logistic regression, statistically significant risk factors are identified and their relationship to the outcome is determined. After a hospital's individual patient predicted values are determined, these values are added to calculate the hospital's predicted outcome. Odds ratios, Z-statistic, model (factor) coefficient, and standard error are all calculated to determine hospital performance.

<sup>viii</sup> Cancer, cardiology & heart surgery, diabetes & endocrinology, ear, nose & throat, gastroenterology & GI surgery, geriatrics, gynecology, nephrology, neurology & neurosurgery, orthopedics, pulmonology, and urology.

<sup>ix</sup> Ophthalmology, psychiatry, rehabilitation, and rheumatology

<sup>x</sup> Goodness of fit statistics were assessed with the WLSMV estimator. Diagonally weighted least squares (WLSMV) estimation is used for categorical data when the variables are not normally distributed. Estimators are used to determine precision of the model. Final models leveraged the Full Information Maximum Likelihood with empirical Bayes estimation of hospital factors and standard errors. Indicator weights are internally validated using the comparative fit index, the Tucker Lewis Index, and the root-mean-square error of association approach.



**Table 10. Hospital Quality Rating and Ranking Systems Comparison**

	CMS Hospital Compare <sup>160</sup>	Consumer Reports Hospital Safety Rating <sup>162</sup>	Healthgrades Patient Safety Excellence Award <sup>167</sup>	Healthgrades America’s 250 Best Hospitals for Clinical Excellence <sup>168</sup>	The Leapfrog Group Hospital Safety Grade <sup>163</sup>	US News & World Report Best Hospitals Honor Roll <sup>137</sup>
Measures	<p>124 measures in the following groups:</p> <ul style="list-style-type: none"> <li>• Mortality</li> <li>• Safety of care</li> <li>• Readmission</li> <li>• Patient experience</li> <li>• Effectiveness of care</li> <li>• Timeliness of care</li> <li>• Efficient use of medical imaging</li> </ul> <p>*Volume used—grouped by specialty procedure</p>	<p>5 categories of measures:</p> <ul style="list-style-type: none"> <li>• Avoiding infections</li> <li>• Avoiding readmissions</li> <li>• Avoiding mortality (medical and surgical)</li> <li>• Communication about medications and discharge</li> <li>• Appropriate use of scanning</li> </ul> <p>*Volume mentioned in relation to low rates resulting in lack of patients</p>	<p>14 Agency for Healthcare Research and Quality (AHRQ) patient safety indicators (PSIs), which include:</p> <ul style="list-style-type: none"> <li>• Mortality among surgical inpatients with serious treatable complications</li> <li>• Postoperative sepsis rate, and</li> <li>• Postoperative hip fracture rates</li> </ul> <p>*Volume not used</p>	<p>Focuses on outcomes data for mortality-based procedures and conditions such as:</p> <ul style="list-style-type: none"> <li>• Heart failure</li> <li>• Stroke</li> <li>• Sepsis</li> </ul> <p>As well as in-hospital complications-based procedures and conditions such as:</p> <ul style="list-style-type: none"> <li>• Abdominal aortic aneurysm repair</li> <li>• Hip and knee replacements</li> </ul> <p>*Volume not used</p>	<p>Measures grouped into 2 categories:</p> <p>1) Process and Structural Measures such as:</p> <ul style="list-style-type: none"> <li>• Physician and nursing staffing</li> <li>• Risk identification and mitigation</li> </ul> <p>2) Outcome Measures such as:</p> <ul style="list-style-type: none"> <li>• Hospital acquired infections</li> <li>• Falls</li> </ul> <p>*Volume used</p>	<p>Measures grouped into 3 categories:</p> <p>1) Process measures such as:</p> <ul style="list-style-type: none"> <li>• Flu immunization</li> <li>• HCAHPS and</li> </ul> <p>2) Structural measures such as:</p> <ul style="list-style-type: none"> <li>• Nurse staffing</li> <li>• Volume</li> </ul> <p>3) Outcomes measures such as:</p> <ul style="list-style-type: none"> <li>• Mortality</li> <li>• Hospital acquired infections</li> <li>• Length of stay</li> </ul> <p>*Volume used</p>
Risk Adjusted	Yes	Yes	Yes	Yes	No	Yes
Scale	5 star rating scale	0.5-100.5 point scale *Not a percentage scale	3 categories: <ul style="list-style-type: none"> <li>• Better than Expected</li> <li>• As Expected</li> <li>• Worse than Expected</li> </ul>	Hospitals are listed as top percentages (e.g. 1%, 5%) and grouped by state.	Letter grade scale (A,B,C,D,F)	3 categories: <ul style="list-style-type: none"> <li>• Below Average</li> <li>• Average</li> <li>• High Performing</li> </ul> *Ranked 1-20 and scored with 0-480 points.
Public Results	<a href="#">CMS Hospital Compare Results</a>	<a href="#">Consumer Reports Public Results</a> (Free results only available for top 10 hospitals)	<a href="#">Healthgrades Patient Safety Excellence Award</a>	<a href="#">Healthgrades Results</a>	<a href="#">Leapfrog Group Hospital Safety Grade</a>	<a href="#">Best Hospitals Rankings and Reviews   US News Best Hospitals</a>



Risk adjustment, as defined by The Joint Commission, is a “statistical process used to identify and adjust for variation in patient outcomes that stem from difference in patient characteristics (or risk factors) across health care organizations.”<sup>173</sup>

In general, comparative studies that examine hospital rating and ranking systems find the systems vastly different with their outcomes (i.e. how/where hospitals rank the scale/grade). For example, a 2015 study examined four popular formal rating systems: U.S. News Best Hospitals, Leapfrog’s Hospital Safety Scores, HealthGrades Top Hospitals, and Consumer Reports.<sup>155</sup> To compare across the four systems, authors stratified hospitals among the four rating/ranking systems as high, medium, and low performers.<sup>155</sup> Results indicate that no hospital was rated as a high performer by all four systems and only 3 hospitals were rated as high performers by three of the four systems.<sup>155</sup> Additionally, only 10 percent of high performing hospitals according to one system were also rated as high performers by another systems.<sup>155</sup> The study also found that Leapfrog and HealthGrades ratings/rankings aligned most frequently, 55 percent of the time, and Consumers Reports and U.S. News agreed on none of the hospitals rated as high performers.<sup>155</sup>

As shown in Table 11, hospital quality rating tools use different scoring systems, ranging from letter grades to point scales. This, in addition to different methodologies for scoring and data collection, make it difficult to compare facilities. Also, the variance in scores as a result of different methodologies leads to confusion among patients, purchasers, and providers and indicates that very few hospitals are superior across all measures.<sup>155</sup> For example, The Johns Hopkins Hospital scores 3/5 stars on CMS Hospital Compare, has an “A” rating from Leapfrog, and is ranked number three by U.S. News and World Report, but is not in the top ten for the Consumer Reports Hospital Safety Rating or in Healthgrades 2018 Patient Safety Excellence Award. Further, there is limited literature on the impact these rating systems have on patient safety or quality of care. Therefore, more investigation is needed, though this is beyond the scope of this Terms of Reference (TOR).



**Table 11.** Hospital Facility Comparison using Multiple Quality Rating Tools

Hospital	Centers for Medicare and Medicaid Services (CMS) Hospital Compare <sup>174</sup>	Consumer Reports 2012 Hospital Safety Rating* <sup>162</sup>	Healthgrades 2018 Patient Safety Excellence Award <sup>165</sup>	Healthgrades America’s 250 Best Hospitals for 2019 <sup>166</sup>	The Leapfrog Group Fall 2018 Hospital Safety Grade <sup>175</sup>	U.S. News and World Report 2018-2019 Best Hospitals Honor Roll Ranking and Points <sup>137</sup>
	Scores: 0 to 5 stars	Safety scores: 0.5 to 100 point scale	Recognizes hospitals in top 10%	Recognizes hospitals in top 1%, top 2% and top 5%	Letter grades: A to F	Ranks top 20; Maximum points: 480
<b>**Billings Clinic (Billings, MT)</b>	3 out of 5 stars	#1 – 72 points	Not in top 10%	Not in top 5%	C	Not in top 20
<b>Cleveland Clinic-Euclid Hospital (Euclid, OH)</b>	5 out of 5 stars	Not in top 10	Not in top 10%	Top 5%	A	#2 – 385 points
<b>Cypress Fairbanks Medical Center (Houston, TX)</b>	2 out of 5 stars	Not in top 10	Top 10%	Not in top 5%	B	Not in top 20
<b>Dartmouth-Hitchcock Medical Center (Lebanon, NH)</b>	3 out of 5 stars	Not in top 10	Not in top 10%	Not in top 5%	C	Not in top 20
<b>**Harris Regional Hospital (Sylva, NC)</b>	1 out of 5 stars	Not in top 10	Not in top 10%	Not in top 5%	A	Not in top 20
<b>The Johns Hopkins Hospital (Baltimore, MD)</b>	3 out of 5 stars	Not in top 10	Not in top 10%	Top 1%	A	#3 – 355 points
<b>Kadlec Regional Medical Center (Richland, WA)</b>	4 out of 5 stars	#5 – 71 Points	Not in top 10%	Not in top 5%	A	Not in top 20
<b>Kaiser Foundation Hospital-San Francisco (San Francisco, CA)</b>	3 out of 5 stars	Not in top 10	Top 10%	Not in top 5%	A	Not in top 20
<b>Mayo Clinic (Rochester, MN)</b>	5 out of 5 stars	Not in top 10	Not in top 10%	Top 1%	B	#1 – 414 points
<b>University of Michigan Hospitals (Ann Arbor, MI)</b>	5 out of 5 stars	Not in top 10	Not in top 10%	Top 5%	A	#5 – 324 points

**Notes:** \*The most recent publically available data is from 2012 and only for the top 10 hospitals without subscription.  
 \*\*Indicates a rural facility



### E.3 OVERVIEW OF HOSPITAL QUALITY TOOLS TO MEASURE SURGICAL QUALITY

In contrast to rating and ranking systems, some tools more directly measure quality and safety. The goal of hospital quality tools are to provide concrete, useful measures that can be used to better inform patients during consent, as well as build, support, and monitor facility progress in maintaining a culture of safety and quality. However, there are multiple approaches to measuring quality and safety, including risk adjusted modeling, algorithms, and individual case review. This leads to difficulty in deciding which tools to use for hospital quality monitoring and what are the best choices for standardization in large health care systems. Table 12 provides a brief summary of the popular hospital quality tools discussed in this section.

#### THE AMERICAN COLLEGE OF SURGEONS NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM

The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) is a “nationally validated, risk-adjusted, outcomes-based program to measure and improve quality of surgical care.”<sup>48</sup> The goal of NSQIP is to measure and improve the quality of surgical care and provide facility-based assessments of surgical outcomes.<sup>45,46</sup> NSQIP is currently being used in over 700 participating hospitals across the government and civilian sectors.<sup>45</sup> At each participating hospital, the NSQIP facility team includes a surgical case reviewer (SCR) and a surgeon champion.<sup>xi,45,46</sup> All clinical reviewers complete a one-month training for certification with annual certification renewal requirements.<sup>45</sup> Within NSQIP, there are three sampling options to obtain data: (1) NSQIP Adult Program: Essential (General/Vascular and Multispecialty); (2) Targeted Procedure (DoD uses and is military medical treatment facility [MTF] specific); and (3) Small Rural (annual surgical volume less than 1,680).<sup>45,46</sup> Essentials Targeted Procedures may not capture 100% of surgical volume, dependent upon SCR resources.<sup>45,46</sup> One full time equivalent (FTE) will abstract 1,680 cases annually.<sup>45,46</sup> NSQIP is currently used in all surgical inpatient MTFs, but currently is not required in the TRICARE network.<sup>46,50</sup> See Appendix D for more information on NSQIP within the Military Health System (MHS).

As mentioned, in January 2019, the ACS partnered with CMS to allow NSQIP hospitals to report surgical outcomes to Hospital Compare.<sup>159</sup> Hospitals participating in the NSQIP Adult Program Option are able to voluntarily publically report on any of the three NQF<sup>xii</sup>-endorsed measures—elderly surgery, colon surgical outcomes, and lower-extremity bypass outcomes.<sup>159,176</sup> Further, this effort provides information on Hospital Compare explaining the rigors of NSQIP for patients to be better informed in their health care decisions.<sup>159</sup>

The use of NSQIP has an overall positive effect on quality of care and appears to be a catalyst for quality improvement. A 2016 study using NSQIP data from 2006 to 2013 concluded that “participation in ACS NSQIP, for up to eight years, is associated with declining observed/expected ratios (improving performance).<sup>177</sup> Further, NSQIP was found to be more

<sup>xi</sup> In general, the SCR is 1 full time equivalent (1.0 FTE) and the surgical champion is 0.1 FTE. However, this varies by program and institution surgical volume.

<sup>xii</sup> National Quality Forum. This is a non-profit organization that is considered a gold-standard for health care quality measurement.



robust and of high quality when comparing with using only morbidity and mortality rates.<sup>178</sup> In 2008, Tennessee formed a 10-hospital Tennessee Surgical Quality Collaborative to share NSQIP surgical processes and outcome data.<sup>179</sup> The Tennessee Surgical Quality Collaborative identified several areas of postoperative improvement from involvement in NSQIP over the two-year period of involvement.<sup>179</sup> Additionally, a 2011 study compared the AHRQ Performance Safety Indicators performed on the NSQIP database experience of general and vascular surgical practices and concluded that AHRQ PSI was a poor performer of clinical outcomes when compared with NSQIP.<sup>154</sup> Thus, participation in NSQIP was shown to be associated with improved outcomes for which the magnitude of improvement depended on the duration of participation.<sup>177</sup> See Appendix D for more information on NSQIP in the MHS.

The Department of Veterans Affairs (VA) NSQIP, during the first two quarters of 2007, identified a mortality rate over four times the expected rate, as calculated by the Veterans Health Administration (VHA), at one medical center.<sup>133</sup> The Office of Inspector General (OIG) Office of Healthcare Inspections (OHI) concluded that there were specific problems of quality of care, including pre-operative, intra-operative, and post-operative care for veteran patients.<sup>133</sup> The review also concluded that, independent of physician expertise, the availability of support services may limit where certain operations should be performed.<sup>133</sup> To address the issue, in 2010, the VHA published the *Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures* (VHA 2010-018<sup>39</sup>) policy requiring each VHA medical facility with an inpatient surgical program to have an infrastructure-based surgical complexity designation.<sup>40</sup> In 2011, the OHI performed a retrospective review of the directive and found that the complex surgeries<sup>xiii</sup> identified in the review were supported by the infrastructure at VHA facilities, as were referrals to non-VHA facilities, meaning the VHA had successfully implemented a system to ensure procedures were conducted at facilities that could support such surgeries.<sup>133</sup>

## AMERICAN COLLEGE OF SURGEONS NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM SURGICAL RISK CALCULATOR

The goal of the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) Surgical Risk Calculator (SRC) is to “provide accurate, patient-specific risk information to guide both surgical decision-making and informed consent.”<sup>180</sup> The SRC uses 20 patient predictors such as age and body mass index (BMI) and the planned procedure (CPT code<sup>xiv,181</sup>), to predict the increased risk of poor outcomes such as readmission, pneumonia, and return to operating room) within 30-days following surgery.<sup>180</sup> It was built with data from 780 hospitals participating in NSQIP from 2013-2017 from over 4.3 million operations.<sup>180</sup> The SRC, free to use, allows for greater transparency and an opportunity to strengthen patient consent and shared decision making as it specifically addresses a patient’s risk factors for individual procedures.

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<sup>xiv</sup> Current Procedural Terminology (CPT) code. These codes are used to report medical service and procedures in outpatient settings, including visits to inpatients by physicians.



Literature addressing the SRC is mixed and it is unclear whether accurately predicts patient outcomes for specific surgeries. The SRC proponents conclude that it provides an accurate estimate of postoperative complications.<sup>182</sup> The SRC was found to accurate in predicting postoperative length of stay, overall and major complications rates for average risk patients, and surgeons who have low rates of major complications for patients laparoscopic colon resections, but it did not accurately adjust for risk at the individual provider level when outliers were included.<sup>183</sup> Researchers at Creighton University evaluated the use of the SRC in bariatric surgery patient populations and found that the calculator accurately predicted 30-day post-operative morbidity and mortality using risk factors and patient data collected by NSQIP.<sup>184</sup> Moreover, a 2017 study examined all literature through 2016 on SRC performance and concluded that overall interpretations of results for the SRC's predictive success were negative, but challenged the methodology of many of these studies.<sup>185</sup>

Other studies have drawn opposing conclusions. For example, a 2016 study found that the tool did not accurately predict 30-day complications among neck and head reconstruction with microvascular free tissue transfer patients.<sup>186</sup> Similar results were concluded for patients undergoing breast-conserving surgery (BCS) for breast cancer; the SRC underestimated the patient's actual risk or the requirement for a second operation<sup>187</sup> and was a poor performer of predicting complications for total hip and knee arthroplasty patients.<sup>188</sup> Thus, providers should consider the procedure type when employing the SRC and have other methods for evaluating patient risk as use of the SRC alone may not be sufficient to inform patients of the operational risks.<sup>187</sup> Authors indicated that the validity of the 21 studies was "severely limited due to the overlapping presence of the several design limitations."<sup>185, p.790</sup>

## AGENCY FOR HEALTHCARE RESEARCH AND QUALITY PATIENT SAFETY INDICATORS

The Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators (PSIs) provide a variety of resources to allow hospitals to optimize patient safety and quality of care including identification of potential adverse events that may need further study and identification of complications occurring in a hospital that may represent patient safety events.<sup>189</sup> The PSIs are a "set of indicators providing information on potential hospital complications and adverse events following surgeries, procedures, and childbirth. The PSIs were developed by a comprehensive literature review, analysis of ICD-9 codes, review by a clinician panel, implementation of risk adjustment, and empirical analyses."<sup>189</sup> Many PSI indicators decrease the likelihood of false positive identification by using specific exclusion criteria.<sup>154</sup>

A 2011 study compared the AHRQ PSI algorithms performed on NSQIP database experience of general and vascular surgical practices.<sup>154</sup> It concluded that while the AHRQ PSI "was not very sensitive for detecting important clinical adverse events, they did reliably identify in the perioperative surgical patient the clinical outcomes for which they were specifically diagnosed."<sup>154, p.946</sup> However, some studies show that there are high variability levels within the sensitivity and specificity of PSIs, possibly because the data used is administrative and not always complete and thus, more validation studies are needed.<sup>190,191</sup> Conversely, some of the PSIs could be used as "canary measures" because they are highly correlated with other PSIs. One study found that a PSI dealing with "selected infections due to medical care" is highly correlated with several other PSI's, making it a quick indicator of overall patient safety status.<sup>192</sup>



## TRADITIONAL MORBIDITY AND MORTALITY CONFERENCES

Early attempts to measure surgical quality of care used administrative data and focused on inpatient mortality and morbidity rates<sup>153</sup> Traditional morbidity and mortality (M&M) conferences aim to provide a forum for hospital personnel to review cases where morbidity and mortality occurred and assess areas of improvement in protocols, systems, and management.<sup>178</sup> The goal of these conferences is to identify lessons learned without blame or indictment of those involved in the case and are typically tracked in a hospital database.<sup>178</sup> Morbidity and mortality conferences are a requirement for all Accreditation Council for Graduate Medical Education (ACGME) accredited residency programs.<sup>178</sup>

In a 2018 study found that M&M conferences offered more granularity, were more inclusive, and had longer follow-up with variation in reporting.<sup>178</sup> The M&M allows surgeons to “critically assess errors and complications, in addition to the learning value for both trainee and staff surgeon.”<sup>178, p.1246</sup> Moreover, there are limitations to conferences including the need for a more standardized way of entering data and mindfulness of the recall/reporting bias since data are often entered in batches, not necessarily as incidents occur.<sup>178,193</sup>

M&M conference data was sometimes incomplete or included entry errors, most likely due to the lack of case/variable definitions.<sup>194</sup> Therefore, multiple approaches to patient risk and adverse event data collection are needed to ensure a comprehensive picture of facility progress.

**Table 12.** Hospital Quality Tools Comparison

	American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) <sup>48</sup>	American College of Surgeons Surgical Risk Calculator (ACS SRC) <sup>180</sup>	Agency for Healthcare Research and Quality Patient Safety Indicators (AHRQ PSI) <sup>189</sup>	Traditional Morbidity and Mortality Conferences <sup>155</sup>
Methodology	Based on manual review of medical records by trained abstractors using defined criteria for complications	Parameters derived from NSQIP data are used to provide estimates	Each indicator suggests occurrence of an adverse event defined by presence of selected ICD-9 diagnosis or procedure codes	Presentation/discussion focused on patient case review with the goal of identifying medical and institutional errors, complications, and solutions
Cost	\$10,000-\$29,000 annual fee	Free	Free	Free
Scores Available to the Public without Cost	No	Yes	Yes	No
Specialty Specific	Yes: Surgery	Yes: Surgery	No	No



## E.4 SURGICAL QUALITY PROGRAMS AT WALTER REED NATIONAL MILITARY MEDICAL CENTER

The following section provides an examination of quality programs currently used at Walter Reed National Military Medical Center (WRNMMC). WRNMMC is the first MTF to participate in all three of the following programs: NSQIP, Leapfrog’s Hospital Survey, and the ACS Surgical Quality Verification Visit (Pilot).

MHS surgical care has a dual mission: Ensuring military surgeons are capable of providing high quality surgical care to wounded combatants in forward deployed settings and provision of safe, high quality surgical care to the 9.5 million active duty, retiree, and dependent beneficiaries in the MHS.<sup>140</sup> Acknowledging this dual mission, the MHS is assessing a number of different methods by which to gauge the quality of surgical care provided in the system.<sup>140</sup> Given the breadth of the MHS surgical quality mission, gauging surgical quality requires varied tools, and prioritization to establish where measurement resources are best utilized to meet the strategic priorities of providing high quality, safe surgical care both in the operational environment and within MTFs.<sup>140</sup>

All 48 inpatient surgical MTFs are enrolled in NSQIP.<sup>xv,45,46</sup> NSQIP information directs quality improvement efforts and aggregate data can provide system-wide assessment about quality of surgical care with respect to 30-day outcomes of operations. NSQIP it is not a substitute for good quality programs but can be used in conjunction with systems already established in patient safety and quality. Table 13 provides an overview of the various positive and negative aspects of NSQIP as it relates to the MHS.

**Table 13.** Positive and Negative Aspects of the American College of Surgeons National Surgical Quality Improvement Program<sup>140</sup>

Positives	Negatives
Measurement of direct outcomes that are important to patients and providers and have objective validity	Does not capture certain events often deemed to be high priority, such as wrong site surgery or unintended retained foreign objects
High fidelity because of reliance on trained abstractor instead of coding and administrative data, overcoming a particularly weak point for MTFs	Requires dedication of full-time equivalent (FTE) resources to a trained abstractor
Statistically robust benchmarking that allows comparison of MTF performance against civilian peers	Window limited to 30-day postoperative morbidity and mortality, so events outside of this window are not captured
Some flexibility to target specific classes of procedures	Excludes ophthalmology, pediatric, and trauma cases
Data is actionable at the hospital level since case information is immediately available	Only covers inpatient surgical care

<sup>xv</sup> However, NSQIP has the capability to collect data for outpatient surgical procedures which may be expanding across the MHS.



The ACS sponsors verification programs in key interdisciplinary areas of health care.<sup>140</sup> This includes trauma center designation (through the Committee on Trauma), cancer center designation (through the Commission on Cancer), and breast care center designation.<sup>140</sup> However, the organization has recognized a gap in criteria by which to assess the overall quality of surgical care. Concomitant with the recent publication of a guiding manual, *Optimal Resources for Surgical Quality and Safety*, the ACS is in the pilot stages of developing a Surgical Quality Verification program.<sup>140</sup> The site visit reviews personnel, processes, organizational components, and data for a comprehensive assessment of the hospital’s programmatic approach toward surgical quality.<sup>140</sup> See Appendix D for more information on the ACS Surgical Quality Verification program. WRNMMC participated as the second hospital, and the first MTF, to take part in this pilot development program.<sup>140</sup> Table 14 provides an overview of the various positive and negative aspects of the ACS Surgical Quality Verification Visit (Pilot) program as it relates to the MHS.

**Table 14.** Positive and Negative Aspects of the American College of Surgeons Surgical Quality Verification Visit (Pilot) Program<sup>140</sup>

Positives	Negatives
Opportunity for exhaustive review of a hospital’s surgical quality approaches ranging from perioperative patient care processes to management of adverse events to credentialing and privileging	Does not generate any data about the quality of care delivered; only reviews existing data; less focus on individual surgeon competency
Provides actionable recommendations to improve the facility approach toward surgical quality	Program currently still in development with full deployment probably at least two years away
Assesses more domains of surgical quality than other existing programs	Even in fully operational state, visits are unlikely to occur at a frequencies much higher than once every 3-5 years

The ACS Quality Verification program has significant potential to provide validation of meeting standards in surgical quality in a more comprehensive manner.<sup>140</sup> It can provide actionable recommendations at a hospital level; however, it continues as a pilot program and at this time, the program will not provide useful comparison information.<sup>140</sup> An enterprise-generated site visit program that has been developed through the MHS Strategic Partnership with the ACS offers some of the same benefits of actionable recommendations but does not carry the same extent of external expert review and would require more resourcing to expand.<sup>140</sup>

WRNMMC is also the first MTF to report Leapfrog data since the MHS announced its partnership in 2018. The Leapfrog Hospital Survey is a free, voluntary survey on safety and quality completed by participating hospitals annually that allows hospitals to benchmark their progress in improving the safety, quality, and efficiency of care delivered.<sup>60,61</sup> See Appendix D for more information on Leapfrog efforts within the MHS. Table 15 provides an overview of the various positive and negative aspects of the Leapfrog Hospital Survey as it relates to the MHS.



**Table 15.** Positive and Negative Aspects of the Leapfrog Hospital Survey<sup>140</sup>

Positives	Negatives
Covers a much broader scope of patient safety and quality process measures than surgical care alone	Specific volume thresholds as a determinant of quality do not carry validity amongst many in surgical community
Requirements for appropriateness of care assessment in the specifically named procedures provides opportunities to ensure that processes exist relevant to making that determination	Focuses specifically on a list of 8 procedure types, bestowing an artificial primacy to these procedures. Does not include other types of high-risk procedural care that are relevant to readiness and whose outcomes are important to track
Some limited outcome information is derived from NHSN-reported data on colectomy-related surgical site infections along with broader hospital based metrics such as CLABSI, CAUTI, etc. <sup>xvi</sup>	Relies on ICD-10 <sup>xvii</sup> and CPT code data that may not be consistently reliable in MTFs
Data is publicly available, to allow for comparison between different facilities and visibility to patients	Links between higher Leapfrog scores and better outcomes remain uncertain

Table 16 shows a comparison of the three quality resources currently used in the MHS (NSQIP across all MTFs and the ACS Surgical Quality Verification [Pilot] program at WRNMMC and Leapfrog Hospital Survey at WRNMMC and expanding across the MHS). The only shared characteristic among the three systems is the ability of actionable information for quality improvement. It is necessary for the MHS to have a clear definition of surgical care to include prioritizing specific outcomes and focus areas for surgical quality improvement.<sup>140</sup> Further, while NSQIP is supported across the military surgical clinical community due to its broadly-accepted validity as a measure of quality, it is difficult to navigate on the MHS transparency website.<sup>140</sup> The ACS Surgical Quality Verification program appears promising with the potential for the greatest actionable data for MTFs to improve clinical quality.<sup>140</sup> Additionally, the Leapfrog Hospital Survey offers the opportunity to assess a broader spectrum of quality and safety of inpatient care throughout any given MTF and for patients to access quality and safety data.<sup>140</sup>

See Appendix D for more information on WRNMMC’s participation in the ACS Surgical Quality Verification pilot program.

<sup>xvi</sup> Central Line Associated Blood Stream Infections (CLABSI); Catheter Associated Urinary Tract Infections (CAUTI)

<sup>xvii</sup> International Classification of Diseases, 10<sup>th</sup> edition (ICD-10) codes are used to report procedures performed in inpatient care settings. They are not used to report physician services.



**Table 16.** Comparison of Three Quality Systems/Tools in the MHS: ACS NSQIP, ACS Surgical Quality Verification Program, and the Leapfrog Hospital Survey<sup>140</sup>

	ACS NSQIP	ACS Surgical Quality Verification Program	Leapfrog Hospital Survey
<b>Mortality Measurement</b>	Yes	No	No
<b>Other Outcome Measurement</b>	Yes	No	Limited
<b>Case Volume Measurement</b>	None	None	Yes for 8 selected procedures
<b>Process Assessment</b>	None	Limited, qualitative	Limited, qualitative
<b>Actionable Information for Quality Improvement</b>	Yes	Yes	Yes
<b>Sentinel Event Data (Unintended retained foreign objects, wrong site surgery)</b>	Yes	No	No
<b>Common Use in Civilian Systems</b>	Yes	No	Yes
<b>Transparency of Results/Publically Available</b>	Facility-determined	No	Complete
<b>Potential Use by Patients to Make Health Care Decisions</b>	Yes, if more accessible	Not in near term	Yes

WRNMMC is the only MTF to participate in all three of the above three mentioned quality programs, although all 48 inpatient surgical MTFs are enrolled in NSQIP and MHS participation in the annual Leapfrog survey is scheduled to expand to additional MTFs that are now under DHA administration and management.<sup>45,46,60,149</sup>

### E.5 OBSERVATIONS

The number of quality measurement programs, both voluntarily and mandatory, has vastly grown as hospitals aim to increase transparency and accountability while improving patient safety and quality of care.<sup>153</sup> These programs also serve to inform the public. The MHS is proactively participating in many of these quality programs to not only improve quality and safety of surgical care, but to increase transparency and patient shared-decision making.

The following observations are made:

- (1) Surgical volume is an imperfect surrogate measure of surgical quality.
- (2) Hospital quality scores should be fully available to the public and their methodologies clearly explained. By doing this, consumer transparency and informed-care decision making can be enhanced.



- (3) Surgical quality scorecards are heterogeneous in data capture, processing, and application. Risk-adjusted methods are widely accepted and have the highest correlation with patient outcomes.
- (4) Transparent assessment of patient safety and quality across MTFs is important to further patient safety and quality of care as the MHS expands participation in civilian quality programs.
- (5) NSQIP is an important tool to support the already established patient safety and quality programs; it is not a substitute for good quality programs. It should be used in conjunction with the quality programs and systems already in place.
- (6) It is important for the purchased care network facilities to be held to the same standards of quality and safety as MTFs in the direct care system. This includes participation in ACS quality programs like NSQIP as well as the Leapfrog Hospital Survey.
- (7) Quality and safety tools and resources are meant to add value to already existing facility quality and safety programs and processes, not be a replacement. *Optimal Resources for Surgical Quality and Safety* identifies several principles to achieve high quality and safety including team-based care, proper surgical leadership, care review/peer review, operational infrastructure, proper credentialing and privileging, a high reliability culture, and proper patient care management.<sup>44</sup> Thus, there are several factors and tools required for high quality patient safety and quality of care that need to be considered together.



## APPENDIX F. TERMS OF REFERENCE

These terms of reference establish the objectives for the Defense Health Board (“the Board”) review of the policies related to performance of complex surgical procedures within the Military Health System (MHS), the risks and mitigation strategies employed to ensure safe, high-quality, efficacious patient care, and the contribution of these procedures to military medical readiness.

**Mission Statement:** The mission of the Board is to provide independent advice and recommendations to maximize the safety and quality of, as well as access to, health care for members of the Armed Forces and other Department of Defense (DoD) beneficiaries.

**Issue Statement:** Research such as that presented in the 2015 U.S. News and World Report story “Risks Are High at Low-Volume Hospitals<sup>xviii</sup>” suggests that patient outcomes are poorer when complex high-risk surgeries such as joint replacements are performed by surgeons who rarely perform such surgeries, in comparison to the same surgery performed by physicians/teams at hospitals where the surgeries are frequently performed using established protocols.

Several large medical systems, including the Johns Hopkins Health System, the University of Michigan Health System, and Dartmouth-Hitchcock Medical Center have recently pledged that their hospitals and surgical staff will meet a minimum annual volume of complex high-risk surgeries as a way of ensuring patient safety. The health care community is divided on the value of such an approach, as it suggests that such surgeries can only be safely performed in large urban medical centers, and may create a priori distrust of small and/or rural hospitals.

The MHS provides a broad array of medical services to Service members and their beneficiaries through both direct care Military Treatment Facilities (i.e., MTFs) and purchased care through TRICARE networks. To meet patient needs, some MTFs currently perform low-volume high-risk surgeries. For patient safety, it is important for the MHS to understand whether there are increased risks associated with low-volume surgery, and to develop policies and methods to prevent and mitigate such risks.

Many MHS facilities perform complex surgeries in low volumes, despite evidence that lower quality outcomes are associated with low-volume, high-complexity surgery. This presents a potential risk to patient safety and the MHS’s reputation for providing safe, high-quality care. There may also be a perception that military medical readiness requirements are driving the MHS to perform low-volume, high-risk procedures to build that readiness in ways that expose patients to elevated risk. It is also unclear to what extent shifting of high-complexity procedures to the purchased-care system, where civilian facilities may likewise perform complex surgeries in low volumes, may place patients at risk. A high-level, independent review of MHS practices in this area is likely to help improve both the safety and quality of MHS care and the confidence of patients in that care. By addressing these issues proactively, the MHS can maintain and enhance the trust of its patients.

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<sup>xviii</sup> <https://www.usnews.com/news/articles/2015/05/19/hospitals-move-to-limit-low-volume-surgeries>



## **Objectives and Scope:**

As priority effort, the Defense Health Board’s Trauma and Injury Subcommittee should:

- Review the array of low-volume high-risk surgical procedures performed by military surgeons in the Direct Care system (MTFs).
- Evaluate policies, protocols, and systems for managing facility surgical capabilities and surgeon/staff proficiency across each of the service branches.
- Develop recommendations to advance standardized policies on managing facility infrastructure capabilities and individual surgeon / supporting staff proficiency across all service branches.
- Evaluate potential MHS applicability of Veterans Health Administration (VHA) Operative Complexity Directives:
  - “Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures” (VHA 2010-018<sup>xix</sup>)
  - “Facility Infrastructure Requirements to Perform Invasive Procedures in an Ambulatory Surgery Center” (VHA 2011-037<sup>xx</sup>)
- Examine the contribution (Knowledge, Skills, and Abilities) of low-volume high-risk procedures to military medical readiness (e.g., surgeons, operating room staff).
- Evaluate MHS policies related to surgical volume transparency and public release of volume, errors and outcomes data.
- Provide recommendations on using the volume, errors and outcome data to inform and enhance policies for managing surgical capabilities and surgeon currency.

As secondary effort, the Trauma and Injury Subcommittee should:

- Review the array of low-volume high-risk surgical procedures performed on MHS beneficiaries in the Purchased Care system (TRICARE).
- Evaluate potential for the MHS to sign on to the “Surgical Volume Pledge” agreed to by Dartmouth-Hitchcock Medical Center, Johns Hopkins Medicine, and the University of Michigan.<sup>xxi</sup>

## **Methodology:**

1. The Trauma and Injury Subcommittee’s assessment will be conducted in compliance with the Federal Advisory Committee Act, DoD Instruction 5105.04 and the Board’s Charter.
2. The Trauma and Injury Subcommittee’s assessment should focus on improving the policies and practices currently in place to (1) determine where high-risk surgical procedures should be performed and (2) optimize the safety and quality of surgical care provided.

<sup>xix</sup> [http://www.va.gov/vhapublications/ViewPublication.asp?pub\\_ID=2227](http://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=2227)

<sup>xx</sup> [http://www.va.gov/vhapublications/ViewPublication.asp?pub\\_ID=2452](http://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=2452)

<sup>xxi</sup> <http://www.nejm.org/doi/full/10.1056/NEJMp1508472>.



3. The Trauma and Injury Subcommittee may conduct interviews and site visits as appropriate.
4. As appropriate, the Trauma and Injury Subcommittee may seek input from other sources with pertinent knowledge or experience.

**Deliverables:** The Board will complete all phases of its work within one year of receiving the tasking. Primary effort will be priorities for completion within six months of receiving the tasking. Primary effort will be related to Direct Care (MTF) areas of review while secondary effort will focus on Purchased Care (TRICARE) review. The Board will, in accordance with its Charter, report to the Assistant Secretary of Defense for Health Affairs, who has been delegated the authority to evaluate the independent advice and recommendation received from the Board and evaluate, in consultation with the Under Secretary of Defense for Personnel and Readiness, what actions or policy adjustments should be made by DoD in response. Progress updates will be provided at each Board meeting.

**Required Support:**

1. The Defense Health Board Support Division will provide any necessary research, analytical, administrative, and logistical support for the Trauma and Injury Subcommittee.
2. Funding for this review is included in the division's operating budget.



## APPENDIX G. MEETINGS AND PRESENTATIONS

### **November 27, 2018 – Trauma and Injury Subcommittee Teleconference**

Members reviewed the tasking and discussed potential briefers, timeline, and report outline.

### **February 6, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of the Clinical Quality Management Plans within the TRICARE purchased care network.

Subject matter experts in attendance included:

- Ms. LaShaina Bradish, Chief of Clinical Quality Management for TRICARE West, Defense Health Agency (DHA)
- Ms. Jeannie Padgett, Subject Matter Expert (SME) Nurse Consultant, TRICARE Health Plan (THP), Policy & Integration Division, DHA
- Ms. Heather Taylor, Nurse Consultant, Clinical Quality Management, Policy & Integration Division, DHA

### **February 7, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of surgical volume and quality programs at Massachusetts General Hospital.

Subject matter expert in attendance included: Dr. Keith Lillemoe, Surgeon-in-Chief and Chief of the Department of Surgery, Massachusetts General Hospital, W. Gerald Austen Professor of Surgery, Harvard Medical School, and Member, National Academy of Medicine

### **February 11, 2019 – Defense Health Board Meeting**

Falls Church, VA

The Trauma and Injury Subcommittee Chair provided a tasking update to Board members.

### **February 22, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of surgical volume and quality programs at Mayo Clinic and Leapfrog Group implementation in the Military Health System (MHS).

Subject matter experts in attendance included:

- Dr. Paul Cordts, Deputy Assistant Director, Medical Affairs (DAD-MA), DHA
- Dr. Stephanie Heller, Division Chief, Trauma, Critical Care and General Surgery, Mayo Clinic,
- Dr. Paula Santrach, Chief Quality Officer, Mayo Clinic and Associate Professor of Laboratory Medicine and Pathology, Mayo Clinic

### **February 27, 2019 – Trauma and Injury Subcommittee Teleconference**



Members received an overview of the American Colleges of Surgeons (ACS) Advisory Council for Rural Surgery (ACRS).

Subject matter experts in attendance included:

- Dr. Tyler Hughes, General Surgeon, McPherson, KS; Clinical Professor of Surgery, Kansas University School of Medicine; and Founding Chair of the ACS ACRS
- Dr. Dr. Michael Sarap, General Surgeon, Cambridge, OH, and Chair of the ACS ACRS

### **February 28, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of ACS surgical volume and quality of care.

Subject matter experts in attendance included:

- Dr. David Hoyt, Executive Director, ACS
- Dr. Clifford Ko, Director, ACS Division of Research and Optimal Patient Care

### **March 18, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of Leapfrog efforts at Walter Reed National Military Medical Center (WRNMMC) and on the 10 “low-volume high-risk surgical” surgical procedures data for TRICARE.

Subject matter experts in attendance included:

- CAPT Saira Aslam, Director for Medicine, WRNMMC
- Ms. Ginger Schwenkler, THP West Operations Support Branch, Analytics & Decision Support Section, DHA
- Ms. Erin Swanson, THP West Operations Support Branch, Analytics & Decision Support Section, DHA

Members also reviewed section of the draft report.

### **March 26, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed sections of the draft report. There were no briefings on this teleconference.

### **March 28, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview of medical force structure, TRICARE, and DHA updates since publication of the first report of this tasking.

Subject matter experts in attendance included:

- Dr. Paul Cordts, Deputy Assistant Director, Medical Affairs (DAD-MA), DHA
- COL Fred Lough, Deputy Chair of Surgery, Uniformed Services University (USU)
- CAPT Edward Simmer, Chief Clinical Officer, TRICARE, DHA
- Dr. Richard Thomas, President, USU



#### **April 4, 2019 – Trauma and Injury Subcommittee Teleconference**

Members received an overview on the Joint Trauma System (JTS), the Surgical Volume Pledge, and the Knowledge, Skills, and Abilities (KSA) program.

Subject matter experts in attendance included:

- CAPT Eric Elster, Professor and Chairman, Department of Surgery, USU
- Col Stacy Shackelford, Director, JTS, Combat Support Agency (CSA), DHA
- Dr. Michael Zinner, Chief Executive Officer (CEO) and Executive Medical Director, Miami Cancer Institute

#### **April 16, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed sections of the draft report. There were no briefings on this teleconference.

#### **April 23, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed sections of the draft report. There were no briefings on this teleconference.

#### **April 26, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed sections of the draft report. There were no briefings on this teleconference.

#### **May 1, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed sections of the draft report. There were no briefings on this teleconference.

#### **May 9, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed the draft report. There were no briefings on this teleconference.

#### **May 10, 2019 – Trauma and Injury Subcommittee Teleconference**

Members reviewed the draft report. There were no briefings on this teleconference.

#### **May 20, 2019 – Defense Health Board Meeting**

Falls Church, VA

The Trauma and Injury Subcommittee Acting Chair and another Subcommittee member provided a decision brief to Board members. Board members voted to approve the report and its findings and recommendations.



## APPENDIX I. ACRONYMS

AAA: Abdominal Aortic Aneurysm  
ABS: American Board of Surgery  
ACGME: Accreditation Council for Graduate Medical Education  
ACS: American College of Surgeons  
ACS ACRS: American College of Surgeons Advisory Council for Rural Surgery  
ACS AEI: American College of Surgeons Accredited Educational Institutes  
AHA: American Hospital Association  
AHRQ: Agency for Healthcare Research and Quality  
AHRQ PSI: Agency for Healthcare Research and Quality Patient Safety Indicators  
ASC: Ambulatory Surgery Center  
ASD(HA): Assistant Secretary of Defense for Health Affairs  
ASSET<sup>®</sup>: Advanced Surgical Skills for Exposure in Trauma  
ATLS<sup>®</sup>: Advanced Trauma Life Support  
ATOM<sup>®</sup>: Advanced Trauma Operative Management  
BCS: Breast-Conserving Surgery  
BEST: Basic Endovascular Skills for Trauma  
BMI: Body Mass Index  
CCC: Combat Casualty Care  
CABG: Coronary Artery Bypass Surgery  
CAP: Corrective Action Plan  
CAS: Carotid Artery Stenting  
CCMD: Combatant Command  
CDC: Centers for Disease Control and Prevention  
CMO: Chief Medical Officer  
CMS: Centers for Medicare and Medicaid Services  
COT: American College of Surgeons Committee on Trauma  
CPG: Clinical Practice Guideline  
CPT: Current Procedural Terminology  
CQM: Clinical Quality Management  
CQMP: Clinical Quality Management Plan  
CRM: Crew Resource Management  
CSA: Combat Support Agency  
C-STARS: Center for Sustainment of Trauma and Readiness Skills  
CT: Cardiothoracic Surgery  
DAD-MA: Defense Health Agency Deputy Assistant Director for Medical Affairs  
DHA: Defense Health Agency  
DHB: Defense Health Board  
DMRTI: Defense Medical Readiness Training Institute  
DoD: Department of Defense  
DoDI: Depart of Defense Instruction  
DoDTR: Department of Defense Trauma Registry  
EHR: Electronic Health Record



EPA: Educational Partnership Agreement  
ER: Emergency Room  
ERSA: External Resource Sharing Agreement  
EVAR: Endovascular Abdominal Aortic Aneurysm Repair  
FBCH: Fort Belvoir Community Hospital  
FTE: Full-Time Equivalent  
FY: Fiscal Year  
GAO: Government Accountability Office  
GME: Graduate Medical Education  
HA: Health Affairs  
HEDIS: Healthcare Effectiveness Data and Information Set  
HHS: Department of Health and Human Services  
HMO: Health Maintenance Organization  
HRO: High Reliability Organization  
HROM: High Reliability Organization Operation Model  
ICU: Intensive Care Unit  
IOM: Institute of Medicine  
ISS: Injury Severity Score  
IT: Information Technology  
JAMA: Journal of the American of Medical Association  
JTET: Joint Trauma Education and Training Directorate  
JTS: Joint Trauma System  
JTS DCoE: Joint Trauma System Defense Center of Excellence  
JTTR: Joint Theater Trauma Registry  
JTTS: Joint Theater Trauma System  
KSA: Knowledge, Skills, and Abilities  
LOS: Length of Stay  
LVM: Latent Variable Modeling  
M&M: Morbidity and Mortality Conference  
M2: MHS Management Analysis and Reporting Tool  
MCSC: Managed Care Support Contractor  
MBSAQIP: Bariatric Surgery Accreditation and Quality Improvement Program  
METC: Medical Education and Training Campus  
MGH: Massachusetts General Hospital  
MHS: Military Health System  
MHSSPACS: Military Health System Strategic Partnership American College of Surgeons  
MILDEP: Military Departments  
Military Services: Army, Navy, and Air Force  
MISSION Act: Maintaining Internal Systems and Strengthening Integrated Outside Network  
MOU: Memoranda of Understanding  
MTF: Military Medical Treatment Facilities  
NASEM: National Academies of Sciences, Engineering, and Medicine  
NCR-MD: National Capital Region-Medical Directorate  
NHRC: Naval Health Research Center



NHSN: National Healthcare Safety Network  
NDAA: National Defense Authorization Act  
NDAA FY 2017: National Defense Authorization Act for Fiscal Year 2017  
NDAA FY 2018: National Defense Authorization Act for Fiscal Year 2018  
NDAA FY 2019: National Defense Authorization Act for Fiscal Year 2019  
NIS: Nationwide Inpatient Sample  
NP: Nurse Practitioner  
NQF: National Quality Forum  
NSQIP: National Surgical Quality Improvement Program  
NTDB: National Trauma Data Bank  
OASD(HA): Office of the Assistant Secretary of Defense Health Affairs  
OEF/OIF: Operation Enduring Freedom and Operation Iraqi Freedom  
OIG: Office of Inspector General  
OGC: Office of General Counsel  
OHI: Office of Healthcare Inspections  
OR: Operating Room  
PA: Physician Assistant  
PDASD(HA): Principal Deputy Assistant Secretary of Defense for Health Affairs  
PCM: Primary Care Manager  
PCMH: Patient Centered Medical Home  
PMPM: Per Member Per Month  
PI: Procedural Instruction  
POS: Point-of-Service  
PPE: Professional Practice Evaluation  
PQI: Potential Quality Issue  
PTSD: Post-Traumatic Stress Disorder  
PSI: Patient Safety Indicator  
PSP: Patient Safety Program  
QI: Quality Issue  
QMC: Quality Management Control  
QPP: Quadruple Aim Performance Plan  
RN: Registered Nurse  
RVU: Relative Value Unit  
SCR: Surgical Case Reviewer  
SMART: Strategic Medical Asset Readiness Training  
SME: Subject Matter Expert  
SQA: Surgical Quality Officer  
SQSC: Surgical Quality and Safety Committee  
SRC: Surgical Risk Calculator  
SRE: Serious Reportable Event  
STS: Society of Thoracic Surgery  
T&I: Trauma and Injury  
TAA: Training Affiliation Agreement  
TCCC: Tactical Combat Casualty Care  
TFL: TRICARE For Life  
THA: Total Hip Arthroplasty



TJC: The Joint Commission  
TKA: Total Knee Arthroplasty  
TNCC: Trauma Nursing Core Course  
TOM: TRICARE Operations Manual  
TOR: Terms of Reference  
TOP: TRICARE Overseas Program  
TQIP: Trauma Quality Improvement Program  
TRICARE: Military Health System purchased care system  
TRISS: Trauma and Injury Severity Score  
TYA: TRICARE Young Adult  
UCC: Urgent Care Center  
USD(P&R): Under Secretary of Defense for Personnel and Readiness  
URAC: Utilization Review Accreditation Commission  
USFHP: Uniformed Services Family Health Plan  
USU: Uniformed Services University  
USUHS: Uniformed Services University of the Health Sciences  
UT: University of Texas  
UTC: Unit Training Code  
VA: Department of Veterans Affairs  
VASQIP: Veterans Affairs Surgical Quality Improvement Program  
VHA: Veterans Health Administration  
VISN: Veterans Integrated Services Network  
VRP: Verification, Review, and Consultation  
VTE: Venous Thromboembolism  
WRNMMC: Walter Reed National Military Medical Center



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## ATTACHMENTS

### ATTACHMENT ONE: EXECUTIVE SUMMARY FOR LOW-VOLUME HIGH-RISK SURGICAL PROCEDURES: SURGICAL VOLUME AND ITS RELATIONSHIP TO PATIENT SAFETY AND QUALITY OF CARE (NOVEMBER 2018)

The Military Health System (MHS) is a federated system of uniformed, civilian and contract personnel and additional civilian partners at all levels of the Department of Defense (DoD).<sup>22</sup> The Defense Health Agency (DHA), as part of the MHS, acts as a Combat Support Agency directing the execution of joint shared services enabling the Army, Navy, Air Force, and Marine Corps medical services to provide a medically ready force and ready medical force to Combatant Commands in both peacetime and wartime.<sup>23</sup> At the same time, the MHS acts as a health agency responsible for maintaining and caring for a very diverse population of young healthy people, families, and significant population of aging beneficiaries and their dependent families. These demographic characteristics accentuate the challenge of maintaining a ready medical force for wartime, while simultaneously and constantly demanding a high quality of care and optimal outcomes throughout the MHS whenever needed. Due to mission requirements, remote military medical treatment facility (MTF) locations, and deployed environments, some procedures are conducted in low frequencies. As part of its charge, the Board assessed the challenges presented in performing low-frequency procedures while ensuring that the facilities where these surgeries are performed are best equipped to provide a level of safety and quality of care that is consistent with the community standard of care.

The quality of combat casualty care demonstrates the advancements of military medicine. Informed by civilian trauma system outcome successes, the Joint Theater Trauma System (JTTS) was developed as a systematic and integrated approach to better organize, coordinate, and optimize battlefield care to minimize morbidity and mortality.<sup>195</sup> Created in 2004 as part of the JTTS, the Joint Theater Trauma Registry (JTTR) tracks combat casualty injury patterns, treatment, and final outcomes. In 2007, JTTR data were compared to civilian trauma systems using the American College of Surgeons (ACS) National Trauma Data Bank (NTDB).<sup>196</sup> The analysis demonstrated that survival and casualty outcome rates for Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) at Role IV sites and beyond appear comparable to the outcomes data in the NTDB.<sup>196</sup> Further, from derived standard calculations of Injury Severity Score (ISS), military ISS and probability of survival (Trauma and Injury Severity Score; [TRISS]), of the patients that incurred battle injuries, more survived these injuries than predicted (approximately 2.75 more patients survived than expected per 100 injured patients; from 2002 to 2007, a total of 788 more patients survived than expected).<sup>196</sup>

Additionally, the original tasking uses the phrase “low-volume high-risk surgical procedures.” However, while the Board acknowledges the intention of this phrase, it does not fully represent the surgical volume and outcome issue due to the dynamic nature of risk, which can vary in different environments. The Board instead uses the phrase “low-intensity” in this report. Low-intensity surgical environments perform procedures for healthier patients with few comorbid conditions, have a lower frequency of procedures, and/or exist with a more basic facility infrastructure and team expertise.



## BRIEF HISTORY OF THE SURGICAL CARE EXPERIENCE AND OUTCOME ASSOCIATION

The surgical care experience and outcomes issue is not exclusive to the military environment but is also a rural health care issue that has been debated in the civilian health care sector for decades. The literature showing a positive correlation to volume and quality (outcomes) is substantial. Increased hospital volume is often correlated with lower complication rates, lower re-operation rates, lower readmission rates, lower mortality rates, and lower costs.<sup>9,10,24-30</sup> However, certain procedures demonstrate a more robust relationship than others (see Appendix B.2). Similarly, there is a body of literature that indicates high-volume surgeons are likely to have better patient outcomes than low-volume surgeons.<sup>13,14</sup> The consensus of 30 years of literature indicates physicians and hospitals with the highest numbers of certain complex surgical procedures achieve the best results.<sup>1</sup>

Volume alone is not an absolute predictor of quality. “Volume should never be used by an accrediting organization as a measure of quality,” says Dr. Mark Chassin, President of The Joint Commission. Each facility and surgeon is unique.<sup>102</sup>

A series of U.S. News & World Report articles<sup>1-3</sup> reported on outcomes in the MHS of 10 Volume Pledge procedures<sup>xxiii</sup> performed between 2012 and 2016 using administrative data from all MTFs. These 10 procedures were included in the Volume Pledge adopted in 2015 by Johns Hopkins Medicine, Dartmouth-Hitchcock Medical Center, and the University of Michigan Health System, and were selected because they have the strongest correlation between hospital volume and patient outcomes in the literature.<sup>32</sup> The effectiveness of the Volume Pledge in promoting patient-centered quality and safety has not been demonstrated in the literature: There is no published outcomes data and no published analyses of effect on access to care<sup>15</sup> and no new sites have signed on to the pledge. The Volume Pledge is imperfect. By using absolute volume thresholds, it conveys a level of arbitrariness and does not account for longitudinal experience.<sup>15,16</sup> For example, if the threshold is 10 operations per year, a surgeon who performs nine is considered a low-volume surgeon, while a surgeon who performs 10 is a high-volume surgeon, regardless of experience. There are concerns that mandatory volume thresholds do not address the fundamental determinants of safety and quality. Further, a system that regionalizes complex operations to hospitals based on volume thresholds may lead to economic and social hardships for patients and families due to prolonged separation, disparities in access to care based on ability to travel, and worsening maldistribution of the surgical workforce due to practice limitations.<sup>10,37</sup> See Appendix B.2 for more information.

The Department of Veterans Affairs (VA) also examined the surgical volume and outcomes association. The VA National Surgical Quality Improvement Program (NSQIP), during the first two quarters of 2007, identified a mortality rate over four times the expected rate, as calculated by the Veterans Health Administration (VHA), at one medical center.<sup>133</sup> The Office of Inspector General (OIG) Office of Healthcare Inspections (OHI) concluded that there were specific

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<sup>xxiii</sup> Esophageal cancer resection, lung cancer resection, pancreatic cancer resection, rectal cancer resection, carotid artery stenting, complex abdominal aortic aneurysm repair, mitral valve repair, bariatric staple surgery, knee replacement, and hip replacement



problems of quality of care, including pre-operative, intra-operative, and post-operative care for veteran patients.<sup>133</sup> The review also concluded that, independent of physician expertise, the availability of support services may limit where certain operations should be performed.<sup>133</sup> To address the issue, in 2010, the VHA published the *Facility Infrastructure Requirements to Perform Standard, Intermediate, or Complex Surgical Procedures* (VHA 2010-018) policy requiring each VHA medical facility with an inpatient surgical program to have an infrastructure-based surgical complexity designation.<sup>40</sup> In 2011, the OHI performed a retrospective review of the directive and found that the complex surgeries<sup>xxiii</sup> identified in the review were supported by the infrastructure at VHA facilities, as were referrals to non-VHA facilities, meaning the VHA had successfully implemented a system to ensure procedures were conducted at facilities that could support such surgeries.<sup>133</sup> See Appendix F.2 for more information.

## PATIENT SAFETY AND QUALITY OF SURGICAL CARE

Although the Board was tasked to evaluate transparency and public release of volume, errors, and outcomes data, these efforts are dependent on a culture that maximizes patient safety and quality of care and is rooted in principles of high reliability, which includes a focus on transparency. The DHA has targeted an opportunity for improvement across the MHS through a High Reliability Organization Operation Model (HROM), the focal point of which is care centered around the patient by Clinical Communities to continuously improve care quality and value, thereby contributing to readiness. DHA's Clinical Quality Management (CQM) functional capability provides enabling expertise to this effort. Professionals in CQM coordinate closely with DHA's Office of Strategy Management for the standardization of improvement processes with intent to integrate resourcing clinical quality improvement and transparency initiatives into MHS overall performance planning.<sup>197</sup> See Appendix D for more information.

The MHS has historically strived for a continuous learning path of improvement, informed by evidence-based practices and lessons-learned. Recently, on a larger scale, the Joint Trauma System (JTS) is an example that is directed at disseminating knowledge that could be used in other areas within the MHS.<sup>143,198</sup> The accomplishments of the JTS were reviewed and highlighted in the National Academies of Sciences, Engineering, and Medicine (NASSEM) *Zero Preventable Deaths* report.<sup>198</sup> The report asserted that the JTS is perhaps the best example of a learning health system that was distinctive by its use of real time data across the compendium of care from injury site to recovery.<sup>198</sup> The DoD JTS trauma registry fostered continual reflection and learning. The JTS adopted an approach known as forced empiricism and continuously delivered real-time performance improvement through the capture of and ongoing evaluation of care and outcomes. The JTS nimbly used the process to provide direct provider learning and correct system deficiencies. Through the acquisition of data, the JTS developed and, modified as needed, evidence-based practice guidelines, such as Tactical Combat Casualty Care (TCCC), designed to reduce variations in practice. The DoD JTS trauma registry data also informed the need for new research and ultimately improved capabilities and patient outcomes. Capitalizing

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<sup>xxiii</sup> Aortic aneurysm surgery, colectomy, craniotomy, esophagectomy, open heart surgery, pancreatectomy, and pneumonectomy



on patient lessons learned and quality improvement processes, the JTS directed comprehensive combat casualty training using TCCC for its soldiers and medics.<sup>198</sup>

An example of this data-driven approach, with implications for civilian trauma systems, includes the 75th Ranger Regiment during combat, where they comprehensively implemented TCCC in Iraq and Afghanistan and realized better outcomes in case fatality and reduction of preventable deaths on the battlefield.<sup>199</sup> On a larger and systemic scale, the DoD JTS trauma registry data informed leaders in Afghanistan of delays in transport of wounded soldiers to forward MTFs. In 2009, this supported the Secretary of Defense directive that all helicopter transport of the critically wounded occur within 60 minutes. This resulted in more rapid arrival of the wounded from an average 90 minute time to 43 minutes and significantly improved survival from more severe injuries compared to that seen in earlier war years.<sup>199</sup>

The MHS has continued to evaluate its practices and to develop a more focused, data-driven way forward. In 2014, the Secretary of Defense ordered a comprehensive review of the MHS to assess access to medical care, quality of that care, and whether a culture of safety was present.<sup>125</sup> The findings from that report were followed by a number of recommendations, many of which were implemented and are further addressed in this report. Recommendations from this review aimed to foster the creation of a High Reliability Organization (HRO) across the MHS. Furthermore, evidence suggests that efforts and programs such as the DoD Patient Safety Program (DoD PSP), MHS Quality Assurance, the MHS Transparency Initiative, and the American College of Surgeons (ACS) NSQIP, now with all MTFs participating, lead to surgical quality improvements and the move to create a more synchronized system for standardization within the MHS.<sup>46,200,201</sup>

## DATA CAPTURE, OPTIMIZATION, AND OUTCOME MEASURES

As stated, accurately capturing data is critical for measuring patient safety and quality of care. ACS NSQIP<sup>48</sup> is a voluntary, “nationally validated, risk-adjusted, outcomes-based program to measure and improve quality of surgical care.”<sup>202</sup> In 2014, 17 MTFs participated in NSQIP; in 2018 it is used in all 48 inpatient MTFs. However, there is room for improvement and standardization of how the data are utilized across the Services. Further, opportunities for improving coding were identified across the Services. Currently, there is a lack of resources to accurately code, suggesting that an investment in experienced coding professionals and resourced analytics support could significantly improve coding accuracy.<sup>203</sup> Challenges for reporting accurate, total surgical volume also include missing data due to difficulty in identifying and capturing procedures conducted off-site (e.g., in a civilian partner hospital or in a VA facility).<sup>46,204-206</sup> See Appendices C and D for more information.

American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) uses data that are:

- From the patient’s medical chart, not insurance claims
- Risk-adjusted
- Case-mix-adjusted
- Based on 30-day patient outcomes



## READY MEDICAL FORCE

The Board was tasked to “examine the contribution of KSAs of low-volume high-risk procedures to military medical readiness.” However, it was necessary to expand this focus area to include a review of military medical readiness overall, since readiness is an essential theme for patient safety and quality. Being medically ready, including medical team readiness, is vital to successfully performing low-intensity procedures and critical to ensuring the establishment and maintenance of integrated team skills in both peacetime and wartime medical settings to reduced variability.

The Knowledge, Skills, and Abilities (KSA) program was created in 2017 to develop a methodology to measure the readiness of the MHS medical force by working in partnership with the ACS.<sup>6</sup> The KSAs identify and capture specific parts of the procedures that give readiness value. A readiness value is given for every procedure with more complex procedures yielding a higher KSA value. Thresholds are developed based on diversity, volume, and acuity.<sup>107</sup> It should be noted that the KSA scores do not determine deployment readiness, but assist leadership with readiness optimization at their clinics and MTFs. The Board acknowledged the KSA model is still in early stages as a pilot program and has only been linked to outcomes in the National Capital Region-Medical Directorate (NCR-MD). Thus far, results indicate MTF Commanders using the KSA metric find them feasible, without negative impact on other key aspects of health care delivery, such as access, safety, or cost, and able to focus the market on new approaches to improve readiness. In the first 90 days of the Proof of Concept, the NCR-MD increased total percentage of general surgeons meeting the KSA threshold from 26% to 30% and from 73% to 77% for orthopedic surgeons.<sup>207</sup> Conceptually, the KSAs have potential for creating an environment of standardization, accountability, and quantifiable results. See Appendix E for more information.

The Joint Trauma Readiness Training Program aims to link the various areas of medical readiness, including the KSAs, with the implementation of *NDAA FY 2017 Sections 707 and 708*, which align the JTS under the DHA. Thus, this model can be used for specific, elective, high-risk procedures. This program will include KSA metrics for clinical practice, formal psychomotor assessment of proficiency in expeditionary skills (Advanced Surgical Skills for Exposure in Trauma [ASSET<sup>®</sup>], Advanced Trauma Operative Management [ATOM<sup>®</sup>], etc.), and team-based training in hyper-realistic, field-based conditions.<sup>208</sup> See Appendix E for more information.

The DoD does not currently have a standardized, team-oriented training curriculum as a program of record. However, team-based training efforts are to be included in the Joint Trauma Readiness Training Program. Effective team training is critical for success in operational units and directly influences the quality of patient care.<sup>209,210</sup> Leveraging technologies, including the use of simulations, allows for maintenance and proficiency of surgical skills.<sup>143</sup> Simulation training is also important for improving team effectiveness specifically with low-frequency, high-acuity emergency situations as the success of these complex procedures depends on the entire surgical team, not just the surgeon.<sup>211</sup> If simulation continues to be reviewed and assessed, the planning discussion should also focus on locating simulation sites near MTFs with lower surgical volume caseload, many of which are located in rural areas.



## STANDARDIZATION

With its efforts centered on patient safety and the delivery of safe, high quality care, the MHS has the opportunity to improve the future of health, not only as an example for military health care but also as a leading force of innovation among all health care systems. The DoD recognizes the importance of modernizing the MHS through standardization of services across all facilities and integration of health care to improve and sustain operational medical force readiness and medical readiness of the Armed Forces, improve access and experience of care, improve health outcomes, and lower costs. The Board's recommendations on standardization align well with the *NDAA FY 2017*, specifically *Section 702 Reform of administration of Defense Health Agency and military medical treatment facilities*. Prior to 1 October 2018, each of the Services were managing their MTFs individually with variation in policies and procedures between the Services. See Appendix B for more information.

Variation and a lack of standardization also currently exists between the Services and the NCR-MD for managing facility surgical capabilities and surgeon/staff proficiency. For example, there is a lack of standardization in Service readiness-training models and partnership development between MTFs and civilian/VA facilities. These training models and partnerships increase case load and demonstrate potential to serve the community as part of the national trauma system.<sup>204-206</sup> This is in transition now with *NDAA FY 2017*, creating an opportunity for shared practices across the Services. Successful practices were identified in each of the Services for various areas, such as the Army's readiness efforts with its Level I Trauma Center, the Navy's Chief Medical Officer (CMO) position, the Air Force's partnership efforts, and the NCR-MD's efforts focused on the KSAs and market expansion/patient recapture. See Appendices C.3 and D.2 for more information.

## LIMITATIONS

The Board was tasked with seven specific charges during the first six months of the review addressing "low-volume high-risk" surgical procedures within the MHS (see Charge to the Defense Health Board and Appendix B). The Board believes that addressing the above four overarching themes, supplemented by research and data in the appendices, will address the seven charges. The Board was also tasked with two additional charges (review the array of low-volume high-risk surgical procedures performed on MHS beneficiaries in the Purchased Care System [TRICARE] and to evaluate the potential for the MHS to sign on to the "Surgical Volume Pledge") as a secondary six-month tasking to follow this report. However, the complexity of the initial tasking required an equally complex and multi-pronged analysis of a way ahead. Therefore, due to the expedited timeline of the report and its expansive scope, there may be certain constraints and a limited ability to fully address the scope in detail due to lack of data, such as an inability to complete a comprehensive product line assessment for surgical subspecialties and an inability to accurately compare civilian and military hospitals based on distinct characteristics of these two entities, including unique, economically driven civilian attributes. Finally, the broadening of the report response, due to a systems-based approach, included an assessment of factors beyond the narrowed focus of "low-volume high-risk surgical



procedures.” Thus, some aspects of this report may be addressed in further detail in the forthcoming second report.

## FINDINGS AND RECOMMENDATIONS

Throughout its review, the Board noted successful practices as well as opportunities to enhance current MHS practices to improve standardization of content and context across all Services for managing surgical capabilities and surgeon currency. Foundational themes emerged to guide the Board’s findings and recommendations:

- (1) A culture of safety and quality is vital for building and sustaining infrastructure that provides safe and high-quality care. A sole focus on volume alone is not adequate to address patient safety or the quality of care and outcomes; there must be a standardized system in place to continuously monitor and proactively address quality and safety concerns in a transparent, non-punitive, data-driven learning environment across the DoD. Further, the surgical team and organizational infrastructure, not only the surgeon, must be viewed as a system whose integrated operation is essential for strengthening safety and quality.
- (2) Data capture, optimization, and outcome measurements for quality of care, patient safety, and transparency efforts are essential to deliver safe and high-quality care to active duty personnel, military retirees, and their beneficiaries. The MHS must ensure appropriate IT infrastructure and analytics are available to support enterprise leaders, providers, and patients, and maximize participation in and develop standardized responses to risk-adjusted outcomes data, such as the ACS NSQIP, a benchmarked, clinical, risk-adjusted, outcomes-based program to measure and improve care across the surgical specialties.
- (3) A focus on the ready medical force is an imperative through utilization of the KSAs, surgical simulation training, and military-civilian partnerships for peacetime and wartime care. The value of trauma experience and the integration of the entire surgical team are critical elements of success. Simulation training should be used to foster surgical team training and prepare teams for deployment operations. These models should be broadened and applied to other areas of surgical performance throughout the MHS.
- (4) There are standardization opportunities across the Services and at the DHA-level, spurred by the *NDAA FY 2017 Section 702*, which states that as of 1 October 2018, the Director of the DHA shall be responsible for the administration and management of the MTFs. Successful practices and policies, such as already established through civilian and VA partnerships to increase both surgeon and surgical team proficiency, simulation training, and infrastructure requirements, should be leveraged.

### Culture of Safety and Quality

#### **Finding 1:**

- A) The DoD has periodically evaluated the medical health delivery system within the three Services and promoted continual learning to assure high quality and safety.
- B) The DHA, by direction of *NDAA FY 2017 Section 702* now has the authority to direct care, quality, and safety across all Services and MTFs. The alignment of all the military health delivery under a central locus of responsibility provides the MHS with the structure to optimize care, quality and safety.



- C) The trauma care system, specifically the JTS, has embraced and benefitted from the continuous learning system that delivers improved outcomes, an understanding of priorities, and unique perspectives. The JTS, now a part of DHA, provides a model for expansion across other domains of the MHS.
- D) The MHS is well positioned to further enhance the system level characteristics necessary to promote continuous learning and improvement of an exceptional learning health system.

**Recommendation 1:**

- A) The Secretary of Defense, DHA Director, and Service leaders must establish an organization-wide culture of performance improvement that is patient-centered with aligned authority, accountability, and transparency as the highest priority.
  - a. The Secretary of Defense, Combatant Commands, and Service Secretaries must support the efforts of the DHA to integrate and optimize healthcare delivery throughout the DoD.
- B) The Secretary of Defense should ensure that the DHA has capabilities to promote a culture of continuous learning and innovation.
  - a. The DHA must establish a comprehensive, standardized, and non-punitive performance improvement process through peer review; root cause analysis; transparent, risk-based prioritization methodology; and ongoing assessment of systems of care to assure patient safety and optimize quality outcomes across the MHS.
  - b. Partnerships between MTFs, civilian medical centers, and VA medical facilities must be increased to provide optimal surgical care for all patients.
  - c. The DHA must have resources (to include personnel, IT, data analytics, and video teleconferencing) for an organization-wide learning system.

**Finding 2:**

- A) Volume is an imperfect standalone measure of quality.
- B) Robust quality and safety programs promote a culture of safety through accountability, verification, and an expansion of best practices.
- C) A learning health system holds great promise specifically for complex systems to deliver best care and optimize outcomes for patients across the system.

**Recommendation 2:**

- A) The MHS quality program must continue to use a quality assessment model that leverages risk-adjusted data, such as NSQIP, to focus on patient outcomes by institution and across the MHS.
- B) MHS leaders must regularly demonstrate that quality improvement and high reliability are valued at all levels of the MHS through openness to identify and address problems, engagement by surgical programs in professional society verification activities, and participation in inter-institutional collaborative to share best practices.
  - a. The MHS quality program must continue to focus on a performance improvement model that leverages risk-adjusted NSQIP data, patient outcomes, and partnerships.
  - b. Regulation and policy barriers for confidentiality of patient safety and quality assurance records, such as *10 U.S.C. 1102* and associated policies must be modified so that safety and quality information cannot be used in a punitive way with regard to individuals, as it hinders open discussions of issues. The VHA has employed this non-punitive approach as facilitated by *38 U.S.C. 5705* and associated policies to ensure similar protection



against punitive use of safety and quality data is mandated by the *Patient Safety and Quality Improvement Act of 2005*. Following the recommendations of *Optimal Resources for Surgical Quality and Safety* by the ACS, the most effective surgical quality-improvement leaders seek to establish a culture where quality improvement and high reliability are valued and requires an explicit infrastructure including policies and procedures that facilitate the achievement of this goal that are built on accountability and fairness for all team members and encourages open and honest discussions of vulnerabilities and problems.

- C) The MHS must adopt a continuously learning healthcare system within the MHS to facilitate the improvement of patient safety and quality.
  - a. A comprehensive view of quality includes NSQIP data, registries and databases derived from electronic health records (EHR), identification of adverse events and care vulnerabilities through the DoD PSP, peer-review programs, and ongoing system analysis.

### **Finding 3:**

- A) MHS programs to inform patients about MTF quality are underutilized.
- B) Public resources are available to enhance patient engagement in shared decision making<sup>xxiv</sup> to include the online ACS Surgical Patient Education Program patient education handouts published in Journal of the American of Medical Association (JAMA).
- C) NSQIP, as a method of transparency within the MHS, is not user-friendly for patients.

### **Recommendation 3:**

- A) Patients in the MHS must be empowered in medical decision-making through access to understandable online information about MTF surgical quality and safety.
- B) Shared decision-making between patients and surgeons must be encouraged throughout the MHS. Transparency must be emphasized through patient consent to procedures and consultation on the risk of complex procedures at the facility where care is being recommended as compared to other available alternatives.
- C) Use of risk-adjusted data, such as NSQIP, for transparency with patients must enable patient-friendly comparisons between MTFs and potential civilian referral centers.

## **Data Capture, Optimization, and Outcome Measures**

### **Finding 4:**

- A) The NSQIP provides risk-adjusted outcome data for all 48 MTFs with surgical services. Results are used by the Services in different ways and to various degrees.
- B) Based on current governance and organizational structure, the NSQIP Steering Committee and MTF surgeon champions are limited in authority to act.

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<sup>xxiv</sup> Shared decision making is a collaborative process in which at least two parties (the patient and provider) work together on treatment options and plans. This approach takes into account patient preferences in decision making and treatment as well as information and risk transparency on the part of the practitioner. Other parties, such as patient family members and allied health professionals, can also take part in this process.



- C) MTFs are limited from participating in national risk-adjusted registries, such as, but not limited to, the ACS Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) and the Trauma Quality Improvement Program (TQIP).
- D) Current Procedural Terminology (CPT) codes are used in the MHS primarily for workload reporting and third-party billing. They are used secondarily in quality and safety metrics. There are discrepancies between surgical services, MTF, and MHS reported volumes due to inaccurate coding. There is a lack of resources for coding accuracy and analysis.
- E) MHS currently has a limited information management infrastructure, though pockets of excellence exist.

**Recommendation 4:**

- A) The DoD must standardize policy and practice regarding use of NSQIP results across the system.
- B) The MHS must empower MTF NSQIP leaders to act upon outcomes in conjunction with MHS NSQIP collaboratives.
- C) The MHS must support MTF participation in national risk-adjusted registries such as, but not limited to, MBSAQIP and TQIP.
- D) Coding must be resourced for improvement in accuracy. Training must be standardized across the MHS to ensure reporting based on CPT codes is as accurate as possible.
- E) The MHS must continue to optimize its IT infrastructure and analytics support, including MHS GENESIS and the MHS Management Analysis and Reporting Tool (M2).

**Ready Medical Force**

**Finding 5:**

- A) Surgical outcomes are a reflection of surgeon and surgical support staff skill, team effectiveness, and facility capabilities.
- B) Within surgeon skill, experience may convey the greatest value toward quality outcomes. The KSA pilot program quantifies deployment-relevant operative skills for surgeons in peacetime operative experience and may drive clinical experience.
- C) Deployments or MTF assignments in low-intensity surgical environments influences readiness and surgical confidence. However, such deployments and remote MTF assignments cannot be avoided.

**Recommendation 5:**

- A) In collaboration with the Services, team training for the entire surgical team for pre-deployment readiness must be standardized in the DoD.
- B) The KSA program must be supported to validate its role in maintaining surgical readiness. The roles of telemedicine, telepresence, and telesurgery with specialists to fill KSA gaps must be explored.
- C) The MHS must address sustainment of surgical skills during and following deployments and assignments in low-intensity surgical environments.

**Finding 6:**

- A) Effective team training is critical for success in operational units and directly influences the quality of patient care. Simulation-based education and training may enable sustainment of surgical and teamwork skills.
- B) Simulation-based education and training throughout the MHS are limited by the lack of consistent funding and accreditation as programs of record.
- C) There is no system of readiness training to objectives through simulation. Most simulation-based activities are Service- or unit-specific.

**Recommendation 6:**

- A) Simulation activities, with associated outcomes data, must be used to prepare the entire surgical team for deployment operations.
- B) Simulation-based activities must align with the goals of the JTS program and be recognized as programs of record with explicit resourcing.
- C) The MHS must develop a more system-wide curriculum of simulation-based activities with measurable outcomes to support deployment timelines. The impact of these activities must be assessed through review of post-deployment care registries.

**Finding 7:**

The military has many operational deployments and remote locations that must be staffed for mission and readiness requirements. Deployment and stations in a low-intensity surgical environment influences readiness. Consistent placement of a surgeon at a rural, low-intensity facility can result in diminished skills for certain complex procedures.

**Recommendation 7:**

The DoD must develop a rotation system for surgeons and surgical teams stationed at low-intensity sites to high-intensity sites, even for short periods of time, to sustain skills. High-intensity civilian environments must be leveraged through expansion of military-civilian partnerships to provide opportunities for the rotation of military medical teams.

**Standardization****Finding 8:**

The policies, procedures, and systems of management are different between the Services; however, pockets of excellence exist. Following implementation of *NDAA FY 2017 Section 702 Reform of administration of DHA and MTFs*, the DHA has administrative and management responsibility for all MTFs and the opportunity to maximize standardization across MTFs.

**Recommendation 8:**

- A) The DHA must proceed with standardization of policies, procedures, and systems across Services and MTFs.
- B) The MHS must continue to identify successful practices and assess opportunities for dissemination through data-driven processes and metrics, such as the Army's Level I Trauma Center, Navy's CMO program, and Air Force's partnership efforts.

**Finding 9:**

- A) The decrease in direct care system enrollment within the MHS further exacerbates the ability to provide care providers with a case load that promotes competency. All Services have successful partnerships at different levels of maturity with civilian hospitals, medical centers, and the VA.
- B) Military healthcare systems in other countries have high capture of their beneficiary population and serve the civilian population, which positively influences caseload, provides care to underserved populations, and supports clinical proficiency of the healthcare professionals.

**Recommendation 9:**

- A) The MHS must expand existing civilian and VA partnerships. *NDAA FY 2017 Section 717 Evaluation and treatment of veterans and civilians at MTFs* allows for civilians and veterans to be treated at MTFs.
  - a. The MHS must leverage best practices from the Services, specifically the Air Force, and ensure providers' work in external facilities is accurately captured.
  - b. The MHS must consider templated partnership agreements at the enterprise-level.
  - c. The MHS must continue to evaluate business models that support qualified military personnel providing care in civilian trauma centers, and, where appropriate, involvement at selected military medical centers.
  - d. The DoD should seek engagement with international partners to increase experience in high-intensity environments.
  - e. MTF commanders must identify opportunities to partner with civilian and VA healthcare institutions to increase experience in high-intensity environments.
- B) The MHS must promote maintenance of competency and proficiency within MTFs by enhancing caseload recapture, and promoting exposure to high-intensity care environments.

**Finding 10:**

- A) The VA's robust quality systems, including a mechanism for evaluating safety mishap events when they occur, are integral to the VA's quality approach. The quality improvement approach is multi-layered with a focus on infrastructure, root cause analysis, peer-review, and NSQIP. These practices highlight the importance addressing the systems-based factors that are responsible for patient outcomes rather than inappropriately oversimplifying as a single issue such as volume.
- B) Through VHA Directive 2010-018, the VA has established a policy regarding the infrastructure requirements for VHA facilities providing in-house surgical services in relationship to the complexity of surgical procedures being performed. The directive is meant to ensure that the infrastructure where procedures are being performed meets the complete needs for good patient care and outcomes.

**Recommendation 10:**

- A) The MHS must adopt patient safety and quality programs similar to those within the VA. Quality programs that ensure collaboration of safety and a wider systems-approach with root cause analysis and the opportunity to respond to close calls (near misses) in real-time are critical for maintaining quality of care.



- B) The MHS must adopt an infrastructure approach similar to that within the VA (VHA 2010-018).



## ATTACHMENT TWO: CPT CODES USED IN M2 DATA EXTRACTION



Scope: Esophagus CPTs (10a)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
43100	EXCISION OF ESOPHAGUS LESION	EXCISION OF LESION, ESOPHAGUS, WITH PRIMARY REPAIR; CERVICAL APPROACH
43101	EXCISION OF ESOPHAGUS LESION	EXCISION OF LESION, ESOPHAGUS, WITH PRIMARY REPAIR; THORACIC OR ABDOMINAL APPROACH
43107	REMOVAL OF ESOPHAGUS	TOTAL OR NEAR TOTAL ESOPHAGECTOMY, WITHOUT THORACOTOMY; WITH PHARYNGOGASTROSTOMY OR CERVICAL ESOPHAGOGASTROSTOMY, WITH OR WITHOUT PYLOROPLASTY (TRANSHIALAL)
43108	REMOVAL OF ESOPHAGUS	TOTAL OR NEAR TOTAL ESOPHAGECTOMY, WITHOUT THORACOTOMY; WITH COLON INTERPOSITION OR SMALL INTESTINE RECONSTRUCTION, INCLUDING INTESTINE MOBILIZATION, PREPARATION AND ANASTOMOSIS(ES)
43112	REMOVAL OF ESOPHAGUS	TOTAL OR NEAR TOTAL ESOPHAGECTOMY, WITH THORACOTOMY; WITH PHARYNGOGASTROSTOMY OR CERVICAL ESOPHAGOGASTROSTOMY, WITH OR WITHOUT PYLOROPLASTY
43113	REMOVAL OF ESOPHAGUS	TOTAL OR NEAR TOTAL ESOPHAGECTOMY, WITH THORACOTOMY; WITH COLON INTERPOSITION OR SMALL INTESTINE RECONSTRUCTION, INCLUDING INTESTINE MOBILIZATION, PREPARATION, AND ANASTOMOSIS(ES)
43116	PARTIAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, CERVICAL, WITH FREE INTESTINAL GRAFT, INCLUDING MICROVASCULAR ANASTOMOSIS, OBTAINING THE GRAFT AND INTESTINAL RECONSTRUCTION
43117	PARTIAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, DISTAL TWO-THIRDS, WITH THORACOTOMY AND SEPARATE ABDOMINAL INCISION, W W/O PROXIMAL GASTRECTOMY; WITH THORACIC ESOPHAGOGASTROSTOMY, W W/O PYLOROPLASTY (IVOR LEWIS)
43118	PARTIAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, DISTAL 2-3RDS, W THORACOTOMY&SEPARATE ABDOMINAL INCIS, WWO PROX GASTRECTOMY; W COLON INTERPSTN/SM INSTINE RECONSTRUCTION, INCL INSTINE MOBILIZATION, PREP,&ANASTOMOSIS(ES)
43121	PARTIAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, DISTAL TWO-THIRDS, WITH THORACOTOMY ONLY, WITH OR WITHOUT PROXIMAL GASTRECTOMY, WITH THORACIC ESOPHAGOGASTROSTOMY, WITH OR WITHOUT PYLOROPLASTY
43122	PARITAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, THORACOABDOMINAL OR ABDOMINAL APPROACH, WITH OR WITHOUT PROXIMAL GASTRECTOMY; WITH ESOPHAGOGASTROSTOMY, WITH OR WITHOUT PYLOROPLASTY



Scope: Esophagus CPTs (10a)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
43123	PARTIAL REMOVAL OF ESOPHAGUS	PARTIAL ESOPHAGECTOMY, THORACOABDOMINAL/ABDOMINAL APPROACH, WWO PROXIMAL GASTRECTOMY; W COLON INTERPOSITION/SM INTESTINE RECONSTRUCTION, INCLUDING INTESTINE MOBILIZATION, PREPARATION,&ANASTOMOSIS(ES)
43124	REMOVAL OF ESOPHAGUS	TOTAL OR PARTIAL ESOPHAGECTOMY, WITHOUT RECONSTRUCTION (ANY APPROACH), WITH CERVICAL ESOPHAGOSTOMY
43130	REMOVAL OF ESOPHAGUS POUCH	DIVERTICULECTOMY OF HYPOPHARYNX OR ESOPHAGUS, WITH OR WITHOUT MYOTOMY; CERVICAL APPROACH
43135	REMOVAL OF ESOPHAGUS POUCH	DIVERTICULECTOMY OF HYPOPHARYNX OR ESOPHAGUS, WITH OR WITHOUT MYOTOMY; THORACIC APPROACH
43289	LAPAROSCOPE PROC, ESOPH	UNLISTED LAPAROSCOPY PROCEDURE, ESOPHAGUS
43310	REPAIR OF ESOPHAGUS	ESOPHAGOPLASTY, (PLASTIC REPAIR OR RECONSTRUCTION), THORACIC APPROACH; WITHOUT REPAIR OF TRACHEOESOPHAGEAL FISTULA
43320	FUSE ESOPHAGUS & STOMACH	ESOPHAGOGASTROSTOMY (CARDIPLASTY), WITH OR WITHOUT VAGOTOMY AND PYLOROPLASTY, TRANSABDOMINAL OR TRANSTHORACIC APPROACH
43360	GASTROINTESTINAL REPAIR	GASTROINTESTINAL RECONSTRUCTION FOR PREVIOUS ESOPHAGECTOMY, FOR OBSTRUCTING ESOPHAGEAL LESION OR FISTULA, OR FOR PREV ESOPHAGEAL EXCLUSION; STOMACH,W W/O PYLOROPLASTY
43361	GASTROINTESTINAL REPAIR	GASTROINTESTINAL RECONS, PREVIOUS ESOPHAGECTOMY, OBSTRUCTING ESOPHAG LES/FIST,/FOR PREVIOUS ESOPHAG EXCLUSION; W COLON INTERPSTN/SM INSTINE RECONS, INCL INSTINE MOBILIZATION, PREP,&ANASTOMOSIS(ES)
43415	REPAIR ESOPHAGUS WOUND	SUTURE OF ESOPHAGEAL WOUND OR INJURY; TRANSTHORACIC OR TRANSABDOMINAL APPROACH
43499	ESOPHAGUS SURGERY PROCEDURE	UNLISTED PROCEDURE, ESOPHAGUS

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Scope: Esophagus CPTs (10a)  
Source: DS Method 4



Scope: Lung CPTs (10b)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
32440	REMOVAL OF LUNG, PNEUMONECTOMY;	REMOVAL OF LUNG, PNEUMONECTOMY;
32442	REMLNG,PNEUMON;SLEEVE PNEUMON	REMOVAL OF LUNG, PNEUMONECTOMY; WITH RESECTION OF SEGMENT OF TRACHEA FOLLOWED BY BRONCHO-TRACHEAL ANASTOMOSIS (SLEEVE PNEUMONECTOMY)
32445	REM,LUNG,PNEUMONECT;EXTRAPLEU R	REMOVAL OF LUNG, PNEUMONECTOMY; EXTRAPLEURAL
32480	LOBECTOMY	REMOVAL OF LUNG, OTHER THAN PNEUMONECTOMY; SINGLE LOBE (LOBECTOMY)
32482	BILOBECTOMY	REMOVAL OF LUNG, OTHER THAN PNEUMONECTOMY; 2 LOBES (BILOBECTOMY)
32484	SEGMENTECTOMY	REMOVAL OF LUNG, OTHER THAN PNEUMONECTOMY; SINGLE SEGMENT (SEGMENTECTOMY)
32486	SLEEVE LOBECTOMY	REMOVAL OF LUNG, OTHER THAN PNEUMONECTOMY; WITH CIRCUMFERENTIAL RESECTION OF SEGMENT OF BRONCHUS FOLLOWED BY BRONCHO-BRONCHIAL ANASTOMOSIS (SLEEVE LOBECTOMY)
32488	COMPLETION PNEUMONECTOMY	REMOVAL OF LUNG, OTHER THAN PNEUMONECTOMY; WITH ALL REMAINING LUNG FOLLOWING PREVIOUS REMOVAL OF A PORTION OF LUNG (COMPLETION PNEUMONECTOMY)
32491	REM,LNG,NOT PNEUM;RES-PLI,EMPH	REMOVAL OF LUNG,OTH THAN PNEUMONECTOMY;W RES-PLICATION OF EMPHYSEMATOUS LUNG(S) (BULLOUS/NON-BULLOUS) FOR LUNG VOLUME REDUCTION,STERNAL SPLIT/TRANSTHORACIC APP,INCL ANY PLEU PROC,WHEN PERFORMED
32501	REPAIR BRONCHUS ADD-ON	RESECTION AND REPAIR OF PORTION OF BRONCHUS (BRONCHOPLASTY) WHEN PERFORMED AT TIME OF LOBECTOMY OR SEGMENTECTOMY (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
32503	RESECT,APICAL LNGTUMR;WO/CHSTWA	RESECTION OF APICAL LUNG TUMOR (EG, PANCOAST TUMOR), INCLUDING CHEST WALL RESECTION, RIB(S) RESECTION(S), NEUROVASCULAR DISSECTION, WHEN PERFORMED; WITHOUT CHEST WALL RECONSTRUCTION(S)
32504	RESECT,APICAL LNGTUMR;W/CHSTWAL	RESECTION OF APICAL LUNG TUMOR (EG, PANCOAST TUMOR), INCLUDING CHEST WALL RESECTION, RIB(S) RESECTION(S), NEUROVASCULAR DISSECTION, WHEN PERFORMED; WITH CHEST WALL RECONSTRUCTION
32505	THORACOT;THER WEDGE RESEC,INIT	THORACOTOMY, WITH THERAPEUTIC WEDGE RESECTION (EG, MASS, NODULE), INITIAL

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Scope: Lung CPTs (10b)  
Source: DS Method 4



Printed: 1/28/18

Scope: Esophagus CPTs (10a)



Scope: Lung CPTs (10b)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
32506	THORACOT;WEDG RESEC,EA AD,IPSI	THORACOTOMY; WITH THERAPEUTIC WEDGE RESECTION (EG, MASS OR NODULE), EACH ADDITIONAL RESECTION, IPSILATERAL (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
32507	THORACOT;DX WEDG,ANA LNG RESEC	THORACOTOMY; WITH DIAGNOSTIC WEDGE RESECTION FOLLOWED BY ANATOMIC LUNG RESECTION (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
32540	REMOVAL OF LUNG LESION	EXTRAPLEURAL ENUCLEATION OF EMPYEMA (EMPHYECTOMY)
32663	THORACOSCOPY,SURG;W LOBECTOMY	THORACOSCOPY, SURGICAL; WITH LOBECTOMY (SINGLE LOBE)
32666	THORACOS,SK;WEDG RES,INITL UNI	THORACOSCOPY, SURGICAL; WITH THERAPEUTIC WEDGE RESECTION (EG, MASS, NODULE), INITIAL UNILATERAL
32667	THORACOS,SK;WED RES,EA AD,IPSI	THORACOSCOPY, SURGICAL; WITH THERAPEUTIC WEDGE RESECTION (EG, MASS OR NODULE), EACH ADDITIONAL RESECTION, IPSILATERAL (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
32668	THORACOS,SK;WEDG RES,ANAT LUNG	THORACOSCOPY, SURGICAL; WITH DIAGNOSTIC WEDGE RESECTION FOLLOWED BY ANATOMIC LUNG RESECTION (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
32669	THORACOS,SK;REMOVAL,1 LUNG SEG	THORACOSCOPY, SURGICAL; WITH REMOVAL OF A SINGLE LUNG SEGMENT (SEGMENTECTOMY)
32670	THORACOSCOPY,SURG;REMOV,2 LOBES	THORACOSCOPY, SURGICAL; WITH REMOVAL OF TWO LOBES (BILOBECTOMY)
32671	THORACOSCOPY,SURG;REMOVAL,LUNG	THORACOSCOPY, SURGICAL; WITH REMOVAL OF LUNG (PNEUMONECTOMY)
32672	THORACOS,SRG;RES-PLI,EMPHY,UNI	THORACOSCOPY, SURGICAL; WITH RESECTION-PLICATION FOR EMPHYSEMATOUS LUNG (BULLOUS OR NON-BULLOUS) FOR LUNG VOLUME REDUCTION (LVRS), UNILATERAL INCLUDES ANY PLEURAL PROCEDURE, WHEN PERFORMED
32998	ABL,RED,1+ PULM TUM,PLE/CH WAL	ABLATION THERAPY FOR REDUCTION OR ERADICATION OF 1 OR MORE PULMONARY TUMOR(S) INCLUDING PLEURA OR CHEST WALL WHEN INVOLVED BY TUMOR EXTENSION, PERCUTANEOUS, RADIOFREQUENCY, UNILATERAL

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Scope: Lung CPTs (10b)  
Source: DS Method 4





Scope: Pancreas CPTs (10c)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
48000	DRAINAGE OF ABDOMEN	PLACEMENT OF DRAINS, PERIPANCREATIC, FOR ACUTE PANCREATITIS;
48001	PLACEMENT OF DRAIN, PANCREAS	PLACEMENT OF DRAINS, PERIPANCREATIC, FOR ACUTE PANCREATITIS; WITH CHOLECYSTOSTOMY, GASTROSTOMY, AND JEJUNOSTOMY
48020	REMOVAL OF PANCREATIC STONE	REMOVAL OF PANCREATIC CALCULUS
48100	BIOPSY OF PANCREAS, OPEN	BIOPSY OF PANCREAS, OPEN (EG, FINE NEEDLE ASPIRATION, NEEDLE CORE BIOPSY, WEDGE BIOPSY)
48102	NEEDLE BIOPSY, PANCREAS	BIOPSY OF PANCREAS, PERCUTANEOUS NEEDLE
48105	RESECT,PANCREAS,ACT NECROTIZ	RESECTION OR DEBRIDEMENT OF PANCREAS AND PERIPANCREATIC TISSUE FOR ACUTE NECROTIZING PANCREATITIS
48120	REMOVAL OF PANCREAS LESION	EXCISION OF LESION OF PANCREAS (EG, CYST, ADENOMA)
48140	PARTIAL REMOVAL OF PANCREAS	PANCREATECTOMY, DISTAL SUBTOTAL, WITH OR WITHOUT SPLENECTOMY; WITHOUT PANCREATICOJEJUNOSTOMY
48145	PARTIAL REMOVAL OF PANCREAS	PANCREATECTOMY, DISTAL SUBTOTAL, WITH OR WITHOUT SPLENECTOMY; WITH PANCREATICOJEJUNOSTOMY
48146	PANCREATECTOMY	PANCREATECTOMY, DISTAL, NEAR-TOTAL WITH PRESERVATION OF DUODENUM (CHILD-TYPE PROCEDURE)
48148	REMOVAL OF PANCREATIC DUCT	EXCISION OF AMPULLA OF VATER
48150	PARTIAL REMOVAL OF PANCREAS	PANCREATECTOMY, PROXIMAL SUBTOTAL WITH TOTAL DUODENECTOMY, PARTIAL GASTRECTOMY, CHOLEDOCHENTEROSTOMY AND GASTROJEJUNOSTOMY (WHIPPLE-TYPE PROCEDURE); WITH PANCREATICOJEJUNOSTOMY
48152	PANCREATECTOMY	PANCREATECTOMY, PROXIMAL SUBTOTAL WITH TOTAL DUODENECTOMY, PARTIAL GASTRECTOMY, CHOLEDOCHENTEROSTOMY AND GASTROJEJUNOSTOMY (WHIPPLE-TYPE PROCEDURE); WITHOUT PANCREATICOJEJUNOSTOMY
48153	PANCREATECTOMY	PANCREATECTOMY, PROXIMAL SUBTOTAL WITH NEAR-TOTAL DUODENECTOMY, CHOLEDOCHENTEROSTOMY AND DUODENOJEJUNOSTOMY (PYLORUS-SPARING, WHIPPLE-TYPE PROCEDURE); WITH PANCREATICOJEJUNOSTOMY
48154	PANCREATECTOMY	PANCREATECTOMY, PROXIMAL SUBTOTAL WITH NEAR-TOTAL DUODENECTOMY, CHOLEDOCHENTEROSTOMY AND DUODENOJEJUNOSTOMY (PYLORUS-SPARING, WHIPPLE-TYPE PROCEDURE); WITHOUT PANCREATICOJEJUNOSTOMY
48155	REMOVAL OF PANCREAS	PANCREATECTOMY, TOTAL



Scope: Pancreas CPTs (10c)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
48160	PANCREAS REMOVAL/TRANSPLANT	PANCREATECTOMY, TOTAL OR SUBTOTAL, WITH AUTOLOGOUS TRANSPLANTATION OF PANCREAS OR PANCREATIC ISLET CELLS
48400	INJECTION, INTRAOOP ADD-ON	INJECTION PROCEDURE FOR INTRAOPERATIVE PANCREATOGRAPHY (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROCEDURE)
48500	SURGERY OF PANCREATIC CYST	MARSUPIALIZATION OF PANCREATIC CYST
48510	DRAIN PANCREATIC PSEUDOCYST	EXTERNAL DRAINAGE, PSEUDOCYST OF PANCREAS
48520	FUSE PANCREAS CYST AND BOWEL	INTERNAL ANASTOMOSIS OF PANCREATIC CYST TO GASTROINTESTINAL TRACT; DIRECT
48540	FUSE PANCREAS CYST AND BOWEL	INTERNAL ANASTOMOSIS OF PANCREATIC CYST TO GASTROINTESTINAL TRACT; ROUX-EN-Y
48545	PANCREATORRHAPHY	PANCREATORRHAPHY FOR INJURY
48547	DUODENAL EXCLUSION	DUODENAL EXCLUSION WITH GASTROJEJUNOSTOMY FOR PANCREATIC INJURY
48548	PANCREATICOJEJUNOSTOMY,ANASTMS	PANCREATICOJEJUNOSTOMY, SIDE-TO-SIDE ANASTOMOSIS (PUESTOW-TYPE OPERATION)
48550	DONOR PANCREAT,W/WO DUODNL SEG	DONOR PANCREATECTOMY (INCLUDING COLD PRESERVATION), WITH OR WITHOUT DUODENAL SEGMENT FOR TRANSPLANTATION
48551	BACKBNCH STD PRP,PANCREAS ALLO	BACKBENCH STANDARD PREPARATION OF CADAVER DONOR PANCREAS ALLOGRAFT PRIOR TO TRANSPLANTATION
48552	BACKBNCH RECS,PANCREAS ALLOGRF	BACKBENCH RECONSTRUCTION OF CADAVER DONOR PANCREAS ALLOGRAFT PRIOR TO TRANSPLANTATION, VENOUS ANASTOMOSIS, EACH
48554	TRANSPL ALLOGRAFT PANCREAS	TRANSPLANTATION OF PANCREATIC ALLOGRAFT
48556	REMOVAL, ALLOGRAFT PANCREAS	REMOVAL OF TRANSPLANTED PANCREATIC ALLOGRAFT
48999	PANCREAS SURGERY PROCEDURE	UNLISTED PROCEDURE, PANCREAS



Scope: Rectal CPTs (10d)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
44145	PARTIAL REMOVAL OF COLON	COLECTOMY, PARTIAL; WITH COLOPROCTOSTOMY (LOW PELVIC ANASTOMOSIS)
44155	REMOVAL OF COLON/ILEOSTOMY	COLECTOMY, TOTAL, ABDOMINAL, WITH PROCTECTOMY; WITH ILEOSTOMY
44207	L COLECTOMY/COLOPROCTOSTOMY	LAPAROSCOPY, SURGICAL; COLECTOMY, PARTIAL, WITH ANASTOMOSIS, WITH COLOPROCTOSTOMY (LOW PELVIC ANASTOMOSIS)
44208	LAP COLECTOMY/COLOPROCTOSTOMY	LAPAROSCOPY, SURGICAL; COLECTOMY, PARTIAL, WITH ANASTOMOSIS, WITH COLOPROCTOSTOMY (LOW PELVIC ANASTOMOSIS) WITH COLOSTOMY
45110	REMOVAL OF RECTUM	PROCTECTOMY; COMPLETE, COMBINED ABDOMINOPERINEAL, WITH COLOSTOMY
45111	PARTIAL REMOVAL OF RECTUM	PROCTECTOMY; PARTIAL RESECTION OF RECTUM, TRANSABDOMINAL APPROACH
45112	REMOVAL OF RECTUM	PROCTECTOMY, COMBINED ABDOMINOPERINEAL, PULL-THROUGH PROCEDURE (EG, COLO-ANAL ANASTOMOSIS)
45113	PARTIAL PROCTECTOMY	PROCTECTOMY, PARTIAL, WITH RECTAL MUCOSECTOMY, ILEOANAL ANASTOMOSIS, CREATION OF ILEAL RESERVOIR (S OR J), WITH OR WITHOUT LOOP ILEOSTOMY
45114	PARTIAL REMOVAL OF RECTUM	PROCTECTOMY, PARTIAL, WITH ANASTOMOSIS; ABDOMINAL AND TRANSACRAL APPROACH
45116	PARTIAL REMOVAL OF RECTUM	PROCTECTOMY, PARTIAL, WITH ANASTOMOSIS; TRANSACRAL APPROACH ONLY (KRASKE TYPE)
45119	PRCTECT,COMBN ABDOMINOPERINEAL	PROCTECTOMY, COMBINED ABDOMINOPERINEAL PULL-THROUGH PROCEDURE (EG, COLO-ANAL ANASTOMOSIS), WITH CREATION OF COLONIC RESERVOIR (EG, J-POUCH), WITH DIVERTING ENTEROSTOMY WHEN PERFORMED
45120	REMOVAL OF RECTUM	PROCTECTOMY, COMPLETE (FOR CONGENITAL MEGACOLON), ABDOMINAL AND PERINEAL APPROACH; WITH PULL-THROUGH PROCEDURE AND ANASTOMOSIS (EG, SWENSON, DUHAMEL, OR SOAVE TYPE OPERATION)
45121	REMOVAL OF RECTUM AND COLON	PROCTECTOMY, COMPLETE (FOR CONGENITAL MEGACOLON), ABDOMINAL AND PERINEAL APPROACH; WITH SUBTOTAL OR TOTAL COLECTOMY, WITH MULTIPLE BIOPSIES
45123	PARTIAL PROCTECTOMY	PROCTECTOMY, PARTIAL, WITHOUT ANASTOMOSIS, PERINEAL APPROACH
45126	PELVIC EXENTERATION	PELVIC EXENTERATION FOR COLORECTAL MALIG, W PROCTECTOMY (W/O COLOSTOMY), W REMOVAL OF BLADDER & URETERAL TRANSPLANTATIONS, &/HYSTERECTOMY/CERVICECTOMY, WWO REM OF TUBE(S), OVARY(S)/ANY COMB THEREOF
45130	EXCISION OF RECTAL PROLAPSE	EXCISION OF RECTAL PROCIDENTIA, WITH ANASTOMOSIS; PERINEAL APPROACH



Scope: Rectal CPTs (10d)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
45135	EXCISION OF RECTAL PROLAPSE	EXCISION OF RECTAL PROCIDENTIA, WITH ANASTOMOSIS; ABDOMINAL AND PERINEAL APPROACH
45136	EXCISE ILEOANAL RESERVOIR	EXCISION OF ILEOANAL RESERVOIR WITH ILEOSTOMY
45150	EXCISION OF RECTAL STRICTURE	DIVISION OF STRICTURE OF RECTUM
45160	EXCISION OF RECTAL LESION	EXCISION OF RECTAL TUMOR BY PROCTOTOMY, TRANSACRAL OR TRANSCOCYGEAL APPROACH
45171	EXC,REC TUM,TRANSAN;NO MUSC PR	EXCISION OF RECTAL TUMOR, TRANSANAL APPROACH; NOT INCLUDING MUSCULARIS PROPRIA (IE, PARTIAL THICKNESS)
45172	EXC,REC TUM,TRANSAN;MUSC PROPR	EXCISION OF RECTAL TUMOR, TRANSANAL APPROACH; INCLUDING MUSCULARIS PROPRIA (IE, FULL THICKNESS)
45395	LAP,SURG;PRCTECT,COMBO,W/CLST	LAPAROSCOPY, SURGICAL; PROCTECTOMY, COMPLETE, COMBINED ABDOMINOPERINEAL, WITH COLOSTOMY
45397	LAP,SRG;PROCTECT,PULL-THRO,RES	LAPAROSCOPY, SURGICAL; PROCTECTOMY, COMBINED ABDOMINOPERINEAL PULL-THROUGH PROCEDURE (EG, COLO-ANAL ANASTOMOSIS), W CREATION, COLONIC RESERVOIR (EG, J-POUCH), W DIVERTING ENTEROSTOMY, WHEN PERFORMED
45400	LAP,SURG;PROCTOPEXY(PROLAPSE)	LAPAROSCOPY, SURGICAL; PROCTOPEXY (FOR PROLAPSE)
45402	LAP,SURG;PROCTOPEXY,W/SIGMOID	LAPAROSCOPY, SURGICAL; PROCTOPEXY (FOR PROLAPSE), WITH SIGMOID RESECTION
45499	UNLISTED LAP PROC, RECTUM	UNLISTED LAPAROSCOPY PROCEDURE, RECTUM
45540	PROCTOPEXY;ABDOM APPR	PROCTOPEXY (EG, FOR PROLAPSE); ABDOMINAL APPROACH
45541	PROCTOPEXY;PERINEAL APPR	PROCTOPEXY (EG, FOR PROLAPSE); PERINEAL APPROACH
45550	PROCTOPEXY;W/SIGMOID RESECT,ABD	PROCTOPEXY (EG, FOR PROLAPSE); WITH SIGMOID RESECTION, ABDOMINAL APPROACH
45560	REPAIR OF RECTOCELE	REPAIR OF RECTOCELE (SEPARATE PROCEDURE)
45562	EXPLORATION/REPAIR OF RECTUM	EXPLORATION, REPAIR, AND PRESACRAL DRAINAGE FOR RECTAL INJURY;
45563	EXPLORATION/REPAIR OF RECTUM	EXPLORATION, REPAIR, AND PRESACRAL DRAINAGE FOR RECTAL INJURY; WITH COLOSTOMY
45800	REPAIR RECT/BLADDER FISTULA	CLOSURE OF RECTOVESICAL FISTULA;
45805	REPAIR FISTULA W/COLOSTOMY	CLOSURE OF RECTOVESICAL FISTULA; WITH COLOSTOMY
45820	REPAIR RECTOURETHRAL FISTULA	CLOSURE OF RECTOURETHRAL FISTULA;
45825	REPAIR FISTULA W/COLOSTOMY	CLOSURE OF RECTOURETHRAL FISTULA; WITH COLOSTOMY
46700	REPAIR OF ANAL STRICTURE	ANOPLASTY, PLASTIC OPERATION FOR STRICTURE; ADULT





Scope: Rectal CPTs (10d)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
46705	REPAIR OF ANAL STRICTURE	ANOPLASTY, PLASTIC OPERATION FOR STRICTURE; INFANT
46706	REPR. ANAL FIST W FIBRIN GLU	REPAIR OF ANAL FISTULA WITH FIBRIN GLUE
46707	REP,ANORECTAL FISTULA W PLUG	REPAIR OF ANORECTAL FISTULA WITH PLUG (EG, PORCINE SMALL INTESTINE SUBMUCOSA [SIS])
46710	REPR,ILEOANAL POUCH;TPRNL APPR	REPAIR OF ILEOANAL POUCH FISTULA/SINUS (EG, PERINEAL OR VAGINAL), POUCH ADVANCEMENT; TRANSPERINEAL APPROACH
46712	REP,ILEOANL POUCH;TRANSPER/ABD	REPAIR OF ILEOANAL POUCH FISTULA/SINUS (EG, PERINEAL OR VAGINAL), POUCH ADVANCEMENT; COMBINED TRANSPERINEAL AND TRANSABDOMINAL APPROACH
46715	REPAIR OF ANOVAGINAL FISTULA	REPAIR OF LOW IMPERFORATE ANUS; WITH ANOPERINEAL FISTULA ("CUT-BACK" PROCEDURE)
46716	REPAIR OF ANOVAGINAL FISTULA	REPAIR OF LOW IMPERFORATE ANUS; WITH TRANSPOSITION OF ANOPERINEAL OR ANOVESTIBULAR FISTULA
46730	CONSTRUCTION OF ABSENT ANUS	REPAIR OF HIGH IMPERFORATE ANUS WITHOUT FISTULA; PERINEAL OR SACROPERINEAL APPROACH
46735	CONSTRUCTION OF ABSENT ANUS	REPAIR OF HIGH IMPERFORATE ANUS WITHOUT FISTULA; COMBINED TRANSABDOMINAL AND SACROPERINEAL APPROACHES
46740	CONSTRUCTION OF ABSENT ANUS	REPAIR OF HIGH IMPERFORATE ANUS WITH RECTOURETHRAL OR RECTOVAGINAL FISTULA; PERINEAL OR SACROPERINEAL APPROACH
46742	REPAIR OF IMPERFORATED ANUS	REPAIR OF HIGH IMPERFORATE ANUS WITH RECTOURETHRAL OR RECTOVAGINAL FISTULA; COMBINED TRANSABDOMINAL AND SACROPERINEAL APPROACHES
46744	REPAIR OF CLOACAL ANOMALY	REPAIR OF CLOACAL ANOMALY BY ANORECTOVAGINOPLASTY AND URETHROPLASTY, SACROPERINEAL APPROACH
46746	REPAIR OF CLOACAL ANOMALY	REPAIR OF CLOACAL ANOMALY BY ANORECTOVAGINOPLASTY AND URETHROPLASTY, COMBINED ABDOMINAL AND SACROPERINEAL APPROACH
46748	REPAIR OF CLOACAL ANOMALY	REPAIR OF CLOACAL ANOMALY BY ANORECTOVAGINOPLASTY AND URETHROPLASTY, COMBINED ABDOMINAL AND SACROPERINEAL APPROACH; WITH VAGINAL LENGTHENING BY INTESTINAL GRAFT OR PEDICLE FLAPS
46750	REPAIR OF ANAL SPHINCTER	SPHINCTEROPLASTY, ANAL, FOR INCONTINENCE OR PROLAPSE; ADULT
46751	REPAIR OF ANAL SPHINCTER	SPHINCTEROPLASTY, ANAL, FOR INCONTINENCE OR PROLAPSE; CHILD
57300	REPAIR RECTUM-VAGINA FISTULA	CLOSURE OF RECTOVAGINAL FISTULA; VAGINAL OR TRANSANAL APPROACH
57305	REPAIR RECTUM-VAGINA FISTULA	CLOSURE OF RECTOVAGINAL FISTULA; ABDOMINAL APPROACH



Scope: Carotid CPTs (10e)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
37215	TRNSCATH,IV STNT,CERV;DIST EMB	TRANSCATHETER PLACEMENT OF INTRAVASCUL STENT(S),CERVICAL CAROTID ARTERY,OPEN/PERCUTANEOUS,INCLUDING ANGIOPLASTY,WHEN PERFORMED,AND RADIOLOGICAL SUPERVISION & INTERPRETATION;W DISTAL EMBOLIC PROTECTION
37216	TRNSCATH,IV STNT,CRV;WO DIS EM	TRANSCATHETER PLACEMENT OF INTRAVASCUL STENT(S),CERVICAL CAROT ARTERY,OPEN/PERCUTANEOUS,INCLUDING ANGIOPLASTY,WHEN PERFORMED,AND RADIOLOGICAL SUPERVISION & INTERPRETATION;W/O DISTAL EMBOLIC PROTECTION
37217	TRNSCATH,INTRAVAS STN,CCA,RET	TRANSCATHETER PLACEMENT OF INTRAVASCUL STENT(S),INTRATHOR COM CAROT ART/INNOM ART,RETROGRAD TREAT,OPN IPSILATERAL CERV CAROT ART EXPOS,INCL ANGIOPLASTY,WHEN PERFORM,& RADIOLOGICAL SUPERVIS & INTERPRET
37218	TRNSCATH,INTRAVAS STNT,CA/INN	TRANSCATHETER PLACEMENT OF INTRAVASCUL STENT(S),INTRATHORACIC COMMON CAROTID ARTERY/INNOM ARTERY,OPEN/PERCUT ANTEGRADE APP,INCLUDING ANGIOPLASTY,WHEN PERFORMED,AND RADIOLOGICAL SUPERVIS & INTERPRET



Scope: Rectal CPTs (10d)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
57307	FISTULA REPAIR & COLOSTOMY	CLOSURE OF RECTOVAGINAL FISTULA; ABDOMINAL APPROACH, WITH CONCOMITANT COLOSTOMY
57308	FISTULA REPAIR, TRANSPERINE	CLOSURE OF RECTOVAGINAL FISTULA; TRANSPERINEAL APPROACH, WITH PERINEAL BODY RECONSTRUCTION, WITH OR WITHOUT LEVATOR PPLICATION



Scope: Aortic CPTs (10f)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
33875	THORACIC AORTIC GRAFT	DESCENDING THORACIC AORTA GRAFT, WITH OR WITHOUT BYPASS
33877	THORACOABDOMINAL GRAFT	REPAIR OF THORACOABDOMINAL AORTIC ANEURYSM WITH GRAFT, WITH OR WITHOUT CARDIOPULMONARY BYPASS
33880	EVASC REPR,DTA;CVRAGE,L SUBCL	ENDOVASC REPR,DESCNDNG THORAC AORTA(ANRYM,PSEUDOANRYM,DISSECT,PENTRATNG ULCER,INTRAMRL HMTMA,TRIC DSRPTN);CVRGE,L SUBCLAVIAN ARTRY ORIGN,INT ENDOPROS-DSNDNG THRAC AORT XTEN(S),CELIAC ARTRY ORIGN
33881	EVASC REPR,DTA;NOCVRGE,L SUBCL	ENDOVASC REPR,DESCNDNG THRAC AORTA(ANRYM,PSEUDOANRYM,DISSECT,PNTRATNG ULCER,INTRAMRL HMTMA,TRIC DSRPTN);NO CVRGE,L SUBCLAVIAN ARTRY ORIGN,INT ENDOPROS-DSNDNG THRAC AORT XTEN(S),CELIAC ARTRY ORIGN
33883	PLCMNT,EVASC REPR,DTA;INT XTEN	PLCMNT, PROXIMAL EXTEN PROSTHESIS, ENDOVASCULAR REPAIR, DESCENDING THORACIC AORTA (EG, ANEURYSM, PSEUDOANEURYSM, DISSECTION, PENETRATING ULCER, INTRAMURAL HEMATOMA, /TRAUMATIC DISRUPTION); INIT EXTEN
33884	PLAC,EX PROS,REP DES TH AOR;AD	PLACE PROX EXTENS PROS,ENDOVASC REPAIR DESC THOR AORTA (EG,ANEURYSM,PSEUDOANEURYSM,DISSECT,PENETRAT ULCER,INTRAMURAL HEMATOMA/TRAUM DISRUPT);EA ADD PROX EXTENS (LIST SEP IN ADD TO CODE FOR PRIM PROC)
33886	PLCMNT,DIA,AFTER EVASC REPR,DTA	PLACEMENT OF DISTAL EXTENSION PROSTHESIS(S) DELAYED AFTER ENDOVASCULAR REPAIR OF DESCENDING THORACIC AORTA
34800	ENDVS REP AB ARTC ANRYM;AORTO	ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSM OR DISSECTION; USING AORTO-AORTIC TUBE PROSTHESIS
34802	ENDOV REP ABD AOR ANRYM;1 DOCK	ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSM OR DISSECTION; USING MODULAR BIFURCATED PROSTHESIS (1 DOCKING LIMB)
34803	ENDOV REP ABD AOR ANRYM;2 DOCK	ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSM OR DISSECTION; USING MODULAR BIFURCATED PROSTHESIS (2 DOCKING LIMBS)
34804	ENDV REP AB ART ANRYM;UNIB BIF	ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSM OR DISSECTION; USING UNIBODY BIFURCATED PROSTHESIS
34805	ENDOVASC ABDO REPAIR W/PROS	ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSM OR DISSECTION; USING AORTO-UNILIAC OR AORTO-UNIFEMORAL PROSTHESIS





Scope: Aortic CPTs (10f)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
34825	EXTEND PRSTH ENDOVASC,INIT VESEL	PLACEMENT OF PROXIMAL OR DISTAL EXTENSION PROSTHESIS FOR ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC OR ILIAC ANEURYSM, FALSE ANEURYSM, OR DISSECTION; INITIAL VESSEL
34826	EXTEND PRSTH ENDOVASC,ADDL VESEL	PLACEMENT, PROXIMAL/DISTAL EXTEN PROSTHESIS, ENDOVASCULAR REPAIR, INFRARENAL ABDOMINAL AORTIC/ILIAC ANEURYSM, FALSE ANEURYSM,/DISSECTION; EA ADDITION VESSEL (LIST SEPARATELY ADDITION CD, 1 PROCEDU
34830	OPEN REP AORT ANRYSM/DISS;TUBE	OPEN REPAIR OF INFRARENAL AORTIC ANEURYSM OR DISSECTION, PLUS REPAIR OF ASSOCIATED ARTERIAL TRAUMA, FOLLOWING UNSUCCESSFUL ENDOVASCULAR REPAIR; TUBE PROSTHESIS
34831	OPN REP AORT ANRYS/DISS:A-B-I	OPEN REPAIR OF INFRARENAL AORTIC ANEURYSM OR DISSECTION, PLUS REPAIR OF ASSOCIATED ARTERIAL TRAUMA, FOLLOWING UNSUCCESSFUL ENDOVASCULAR REPAIR; AORTO-BI-ILIAC PROSTHESIS
34832	OPN REP AORT ANRYS/DISS:AOR-BI	OPEN REPAIR OF INFRARENAL AORTIC ANEURYSM OR DISSECTION, PLUS REPAIR OF ASSOCIATED ARTERIAL TRAUMA, FOLLOWING UNSUCCESSFUL ENDOVASCULAR REPAIR; AORTO-BIFEMORAL PROSTHESIS
34841	ENDOVAS REP,VIS AORT;1 ENDOPRO	ENDOVASC REP,VISCERAL AORTA (EG,ANEUR,PSEUDOANEUR,DISSECT,PENETRAT ULCER,INTRAMUR HEMATOMA/TRAUM DISRUPT),DEPLOY OF FENEST VIS AORT ENDOGRFT & ALL ASSOC RAD SUP &INT; 1 VISCERAL ART ENDOPROSTHESIS
34842	ENDOVAS REP,VIS AORT;2 ENDOPRO	ENDOVASC REP,VISCERAL AORTA (EG,ANEUR,PSEUDOANEUR,DISSECT,PENETRAT ULCER,INTRAMUR HEMATOMA/TRAUM DISRUPT),DEPLOY OF FENEST VIS AORT ENDOGRFT & ALL ASSOC RAD SUP &INT; 2 VISCERAL ART ENDOPROSTHESIS
34843	ENDOVAS REP,VIS AORT;3 ENDOPRO	ENDOVASC REP,VISCERAL AORTA (EG,ANEUR,PSEUDOANEUR,DISSECT,PENETRAT ULCER,INTRAMUR HEMATOMA/TRAUM DISRUPT),DEPLOY OF FENEST VIS AORT ENDOGRFT & ALL ASSOC RAD SUP &INT; 3 VISCERAL ART ENDOPROSTHESIS
34844	ENDOVAS REP,VIS AORT;4+ENDOPRO	ENDOVASC REP,VISCERAL AORTA (EG,ANEUR,PSEUDOANEUR,DISSECT,PENETRAT ULCER,INTRAMUR HEMATOMA/TRAUM DISRUPT),DEPLOY OF FENEST VIS AORT ENDOGRFT & ALL ASSOC RAD SUP &INT;4/MORE VISCERAL ART ENDOPROSTHESSES
34845	ENDOVAS REP,VIS &INF AB AORT;1	ENDOVASC REP,VIS AORT&INFRAREN AB AORT W FENES VIS AORT ENDOGRAFT &CONCOMIT UNIBDY/MOD INFRAREN AORT ENDOGRAFT &ALL RAD SUP&INT,TARGET ZONE ANGIOPLASTY,WHEN PERFORM; 1 VISCERAL ART ENDOPROSTHESIS



Scope: Aortic CPTs (10f)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
35361	THROMBOEND;COMBINED AORTOILIAC	THROMBOENDARTERECTOMY, INCLUDING PATCH GRAFT, IF PERFORMED; COMBINED AORTOILIAC
35363	THROMBOEN;COMBINE AORTOILIOFEM	THROMBOENDARTERECTOMY, INCLUDING PATCH GRAFT, IF PERFORMED; COMBINED AORTOILIOFEMORAL



Scope: Aortic CPTs (10f)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
34846	ENDOVAS REP,VIS &INF AB AORT;2	ENDOVASC REP,VIS AORT&INFRAREN AB AORT W FENES VIS AORT ENDOGRAFT &CONCOMIT UNIBDY/MOD INFRAREN AORT ENDOGRAFT &ALL RAD SUP&INT,TARGET ZONE ANGIOPLASTY,WHEN PERFORM; 2 VISCERAL ART ENDOPROSTHESIS
34847	ENDOVAS REP,VIS &INF AB AORT;3	ENDOVASC REP,VIS AORT&INFRAREN AB AORT W FENES VIS AORT ENDOGRAFT &CONCOMIT UNIBDY/MOD INFRAREN AORT ENDOGRAFT &ALL RAD SUP&INT,TARGET ZONE ANGIOPLASTY,WHEN PERFORM; 3 VISCERAL ART ENDOPROSTHESIS
34848	ENDOV REP,VIS &INF AB AORT;4/+	ENDOVASC REP,VIS AORT&INFRAREN AB AORT W FENES VIS AORT ENDOGRAFT &CONCOMIT UNIBDY/MOD INFRAREN AORT ENDOGRAFT &ALL RAD SUP&INT,TARGET ZONE ANGIOPLASTY,WHEN PERFORM;4/MORE VISCERAL ART ENDOPROSTHESSES
35081	REPAIR DEFECT OF ARTERY	DIRECT REPAIR OF ANEURYSM, PSEUDOANEURYSM, OR EXCISION AND GRAFT INSERTION, WITH OR WITHOUT PATCH GRAFT; FOR ANEURYSM, PSEUDOANEURYSM, AND ASSOCIATED OCCLUSIVE DISEASE, ABDOMINAL AORTA
35082	REPAIR ARTERY RUPTURE, AORTA	DIRECT REPAIR OF ANEURYSM, PSEUDOANEURYSM, OR EXCISION AND GRAFT INSERTION, WITH OR WITHOUT PATCH GRAFT; FOR RUPTURED ANEURYSM, ABDOMINAL AORTA
35091	REPAIR DEFECT OF ARTERY	DIRECT REPAIR, ANEURYSM, PSEUDOANEURYSM,EXCISION&GRAFT INSERTION, WITH/WITHOUT PATCH GRAFT; FOR ANEURYSM, PSEUDOANEURYSM,&ASSOCIATED OCCLUSIVE DISEASE, ABDOMINAL AORTA INVOLVING VISCERAL VESSELS
35092	REPAIR ARTERY RUPTURE, AORTA	DIRECT REPAIR OF ANEURYSM, PSEUDOANEURYSM, OR EXCISION AND GRAFT INSERTION, WITH OR WITHOUT PATCH GRAFT; FOR RUPTURED ANEURYSM, ABDOMINAL AORTA INVOLVING VISCERAL VESSELS
35102	REPAIR DEFECT OF ARTERY	DIRECT REPAIR, ANEURYSM, PSEUDOANEURYSM, OR EXCISION&GRAFT INSERTION, WITH OR WITHOUT PATCH GRAFT; FOR ANEURYSM, PSEUDOANEURYSM,&ASSOCIATED OCCLUSIVE DISEASE, ABDOMINAL AORTA INVOLVING ILIAC VESSELS
35103	DIR REP,ANEU;RUPT,ABD AOR,ILIA	DIRECT REPAIR OF ANEURYSM, PSEUDOANEURYSM, OR EXCISION AND GRAFT INSERTION, WITH OR WITHOUT PATCH GRAFT; FOR RUPTURED ANEURYSM, ABDOMINAL AORTA INVOLVING ILIAC VESSELS



Scope: Mitral Valve CPTs (10g)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
33418	TRANSCATH MITR VAL REP;INITIAL	TRANSCATHETER MITRAL VALVE REPAIR, PERCUTANEOUS APPROACH, INCLUDING TRANSEPTAL PUNCTURE WHEN PERFORMED; INITIAL PROSTHESIS
33419	TRANSCATH MITR VAL REP;ADD PRO	TRANSCATHETER MITRAL VALVE REPAIR,PERCUTANEOUS APP,INCLUDING TRANSEPTAL PUNCTURE WHEN PERFORMED;ADDITIONAL PROSTHESIS(ES) DURING SAME SESSION (LIST SEPARATELY IN ADDITION TO CODE FOR PRIMARY PROC)
33420	REVISION OF MITRAL VALVE	VALVOTOMY, MITRAL VALVE; CLOSED HEART
33422	REVISION OF MITRAL VALVE	VALVOTOMY, MITRAL VALVE; OPEN HEART, WITH CARDIOPULMONARY BYPASS
33425	REPAIR OF MITRAL VALVE	VALVULOPLASTY, MITRAL VALVE, WITH CARDIOPULMONARY BYPASS;
33426	REPAIR OF MITRAL VALVE	VALVULOPLASTY, MITRAL VALVE, WITH CARDIOPULMONARY BYPASS; WITH PROSTHETIC RING
33427	REPAIR OF MITRAL VALVE	VALVULOPLASTY, MITRAL VALVE, WITH CARDIOPULMONARY BYPASS; RADICAL RECONSTRUCTION, WITH OR WITHOUT RING
33430	REPLACEMENT OF MITRAL VALVE	REPLACEMENT, MITRAL VALVE, WITH CARDIOPULMONARY BYPASS
33600	CLOSURE OF VALVE	CLOSURE OF ATRIOVENTRICULAR VALVE (MITRAL OR TRICUSPID) BY SUTURE OR PATCH
92987	REVISION OF MITRAL VALVE	PERCUTANEOUS BALLOON VALVULOPLASTY, MITRAL VALVE





Scope: Bariatric CPTs(10h)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
43644	LAPARO,SX,GASTRIC RESTRICT PROC	LAPAROSCOPY, SURGICAL, GASTRIC RESTRICTIVE PROCEDURE; WITH GASTRIC BYPASS AND ROUX-EN-Y GASTROENTEROSTOMY (ROUX LIMB 150 CM OR LESS)
43659	LAPAROSCOPE PROC, STOM	UNLISTED LAPAROSCOPY PROCEDURE, STOMACH
43775	LAP,SRG,GAS RESTR,LONG GASTREC	LAPAROSCOPY, SURGICAL, GASTRIC RESTRICTIVE PROCEDURE; LONGITUDINAL GASTRECTOMY (IE, SLEEVE GASTRECTOMY)
43846	GASTRC RSTRC PRC,BP;SHORT LIMB	GASTRIC RESTRICTIVE PROCEDURE, WITH GASTRIC BYPASS FOR MORBID OBESITY; WITH SHORT LIMB (150 CM OR LESS) ROUX-EN-Y GASTROENTEROSTOMY
43847	GASTRIC BYPASS FOR OBESITY	GASTRIC RESTRICTIVE PROCEDURE, WITH GASTRIC BYPASS FOR MORBID OBESITY; WITH SMALL INTESTINE RECONSTRUCTION TO LIMIT ABSORPTION
43848	REV,GAS REST,MORB OBES,NOT ADJ	REVISION, OPEN, OF GASTRIC RESTRICTIVE PROCEDURE FOR MORBID OBESITY, OTHER THAN ADJUSTABLE GASTRIC RESTRICTIVE DEVICE (SEPARATE PROCEDURE)



Scope: Hip CPTs(10i)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
27120	RECONSTRUCTION OF HIP SOCKET	ACETABULOPLASTY; (EG, WHITMAN, COLONNA, HAYGROVES, OR CUP TYPE)
27122	RECONSTRUCTION OF HIP SOCKET	ACETABULOPLASTY; RESECTION, FEMORAL HEAD (EG, GIRDLESTONE PROCEDURE)
27125	PARTIAL HIP REPLACEMENT	HEMIARTHROPLASTY, HIP, PARTIAL (EG, FEMORAL STEM PROSTHESIS, BIPOLAR ARTHROPLASTY)
27130	TOTAL HIP ARTHROPLASTY	ARTHROPLASTY, ACETABULAR AND PROXIMAL FEMORAL PROSTHETIC REPLACEMENT, WITH OR WITHOUT AUTOGRAFT OR ALLOGRAFT
27132	TOTAL HIP ARTHROPLASTY	CONVERSION OF PREVIOUS HIP SURGERY TO TOTAL HIP ARTHROPLASTY, WITH OR WITHOUT AUTOGRAFT OR ALLOGRAFT
27134	REVISE HIP JOINT REPLACEMENT	REVISION OF TOTAL HIP ARTHROPLASTY; BOTH COMPONENTS, WITH OR WITHOUT AUTOGRAFT OR ALLOGRAFT
27137	REVISE HIP JOINT REPLACEMENT	REVISION OF TOTAL HIP ARTHROPLASTY; ACETABULAR COMPONENT ONLY, WITH OR WITHOUT AUTOGRAFT OR ALLOGRAFT
27138	REVISE HIP JOINT REPLACEMENT	REVISION OF TOTAL HIP ARTHROPLASTY; FEMORAL COMPONENT ONLY, WITH OR WITHOUT ALLOGRAFT



Scope: Knee CPTs(10j)

Low Volume | High Risk Surgical Procedures

CPT	Description Short	Description Long
27440	REVISION OF KNEE JOINT	ARTHROPLASTY, KNEE, TIBIAL PLATEAU;
27441	REVISION OF KNEE JOINT	ARTHROPLASTY, KNEE, TIBIAL PLATEAU; WITH DEBRIDEMENT AND PARTIAL SYNOVECTOMY
27442	REVISION OF KNEE JOINT	ARTHROPLASTY, FEMORAL CONDYLES OR TIBIAL PLATEAU(S), KNEE
27443	REVISION OF KNEE JOINT	ARTHROPLASTY, KNEE, FEMORAL CONDYLES OR TIBIAL PLATEAUS; WITH DEBRIDEMENT AND PARTIAL SYNOVECTOMY
27445	REVISION OF KNEE JOINT	ARTHROPLASTY, KNEE, HINGE PROSTHESIS (EG, WALLDIUS TYPE)
27446	REVISION OF KNEE JOINT	ARTHROPLASTY, KNEE, CONDYLE AND PLATEAU; MEDIAL OR LATERAL COMPARTMENT
27447	TOTAL KNEE ARTHROPLASTY	ARTHROPLASTY, KNEE, CONDYLE AND PLATEAU; MEDIAL AND LATERAL COMPARTMENTS WITH OR WITHOUT PATELLA RESURFACING

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Scope: Hip CPTs(10i)  
Source: DS Method 4





ATTACHMENT THREE: TRICARE DATA FOR 10 “LOW-VOLUME HIGH-RISK” SURGICAL PROCEDURES BY PROVIDER MARKET AREA

Provider Market Area	Bariatric Surgery	Cartoid Arterial Stenting	Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
NCR eMSM	84	8	17	24	582	838	54	37	39	82	1,765
TIDEWATER eMSM	201	17	24	7	492	815	23	47	15	68	1,709
NON-PSA_NORTH CAROLINA	87	9	6	25	474	683	74	38	16	78	1,490
NON-PSA_TENNESSEE	91	22	16	12	374	665	69	30	23	64	1,366
MACDILL-CLEARWATER MKT	89	14	12	10	341	507	76	23	20	84	1,176
NH JACKSONVILLE	189	29	3	22	253	448	48	48	19	80	1,139
SAMHS eMSM	89	3	4	4	273	653	25	10	13	41	1,115
NBHC FORT WORTH	137	16	17	6	279	504	40	31	9	60	1,099
NON-PSA_FLORIDA	40	27	20	7	371	480	41	15	13	46	1,060
NON-PSA_OHIO	49	13	16	4	269	506	36	41	20	66	1,020
FT MCPHERSON BRAC	73	6	11	11	286	407	48	39	21	77	979
LUKE AFB	63	7	8	6	269	426	42	36	17	80	954
NH ORLANDO BRAC	37	10	3	7	193	380	25	26	9	53	743
TINKER AFB	69	15	4	1	204	349	30	19	9	29	729
MADIGAN AMC-FT LEWIS	49	13	8	7	235	286	40	22	24	45	729
BUCKLEY AFB	38		12	10	175	309	30	14	18	68	674
NON-PSA_WISCONSIN	22	6	3	4	179	337	26	14	10	22	623
COLORADO SPRINGS AREA	5	6	4	1	194	337	19	21	1	29	617
NON-PSA_TEXAS	52	8	2	11	120	348	20	21	6	27	615
CHARLESTON MSM	63	7	9	10	155	271	21	19	18	37	610
NMC-SAN DIEGO	30	8	9	2	185	256	29	36	12	41	608
NON-PSA_PENNSYLVANIA	32	6	6	7	157	274	25	15	7	19	548
SCOTT AFB	56	5	10	9	142	252	17	22	11	22	546
MUNSON AHC-FT LEAVENWORTH	65	2	5	5	136	231	28	10	15	38	535
JACKSON-SHAW MSM	68	6	2	2	123	283	14	10	4	19	531
MCGUIRE AFB	50	6	5	2	144	230	37	12	6	34	526
FT BRAGG	14	1	1	4	144	315	18	5		14	516
NON-PSA_ALABAMA	54	5	9	3	108	220	28	32	11	40	510
FT HOOD	86	9	5	4	114	220	35	5	7	22	507
HILL AFB	35	2	3	3	146	277	5	11	6	17	505
PATRICK AFB	64	3	1	2	124	255	22	8		24	503
REDSTONE ARSENAL	47	2	2	2	134	254	14	9	1	26	491
FT KNOX	38	5	3	5	142	253	14	6	3	18	487
FORT WALTON MKT		5			165	262	19	13	2	13	479
LITTLE ROCK AFB	38	5	4	5	112	262	15	14	5	17	477
DAVIS-MONTHAN AFB	42	9	7	3	120	221	23	21	5	21	472
NON-PSA_MICHIGAN	32	4	4	4	126	226	14	11	3	23	447
GRISSOM-HARRISON BRAC	22	1	9	4	118	237	9	4	12	20	436
FT LEE	37	1	3	4	150	174	18	12	10	25	434
USCG HOUSTON/GALVESTON	61	3	9	7	91	150	28	14	10	32	405



Provider Market Area	Bariatric Surgery	Cartoid Arterial Stenting		Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
NON-PSA_SOUTH CAROLINA	16	5		4	2	118	208	16	4	5	22	400
LOS ANGELES AFB	23	5		7	1	126	153	22	15	15	29	396
OFFUTT AFB	26	4		3	4	107	187	17	5	5	21	379
DUNHAM AHC-CARLISLE BARRACKS MKT	31	6		3	3	101	187	14	11	3	18	377
MN NON PRIME	12	5		10	15	100	181	15	7	7	25	377
HANSCOM AFB-USCG BOSTON MKT	17	2		5	5	115	154	32	8	10	24	372
TRAVIS AFB	11	2		5	31	113	142	15	27	3	22	371
NH PENSACOLA	46	13		3	2	79	150	9	8	7	33	350
NELLIS AFB	70	4		9	4	87	116	15	11	2	23	341
NHC CHERRY POINT	63					69	200				6	338
FT RUCKER	49	2			1	66	184	6			3	311
WRIGHT-PATTERSON AFB	45	10			2	82	126	16	5	5	17	308
FT STEWART	25	1	1		1	91	137	19	3	7	20	305
SELECT-MN-MINNEAPOLIS	12	1	1		2	113	142	6	10	1	14	302
NON-PSA_INDIANA	9	6	1		1	65	175	25	5		14	301
NON-PSA_OKLAHOMA	22	10		3	2	65	164	6	7	2	19	300
BERGSTROM AFB BRAC	32	19		5		84	98	7	17	5	31	298
LOVELL FHCC	10	1	1		5	95	128	17	5	7	18	287
FAIRCHILD AFB	12		1		3	72	154	11	5		12	270
NON-PSA_MISSISSIPPI	23	4		3	2	73	137	6	6	3	12	269
NON-PSA_VIRGINIA	14	4		9	3	66	130	14	9	9	11	269
NON-PSA_LOUISIANA	21	8		2		82	133	6	2	3	10	267
NON-PSA_ARKANSAS	24	12		2		67	129	10	1	3	18	266
NBHC MID SOUTH	16	13		7	2	60	121	17	5	5	18	264
KIRTLAND AFB	16	1		4	4	63	151	8	3	4	8	262
USCGC-ALAMEDA	7	4		6	7	74	101	10	11	9	25	254
FT BENNING	13			3		87	119	4	3	5	9	243
NON-PSA_NEW YORK	23	1	1		4	60	125	7	2	2	9	234
BARKSDALE AFB	28	6		1	2	47	113	7	7	6	15	232
ROBINS AFB	24	7		3		54	120	5	2	4	9	228
BELLE CHASE-NEW ORLEANS MKT	45	3		4	1	53	96	5	1	6	10	224
SELECT-MO-SPRINGFIELD	19	10		1		57	107	4	11		14	223
MT NON PRIME	3	1				75	114	9	7	1	12	222
USCG NEW YORK	21	2		1	5	67	75	14	14	5	17	221
USCG DETROIT	11	1		4		70	106	8	3	1	10	214
SELECT-BOISE-NAMPA	14			1		72	108	7	4	2	5	213
SELECT-PORTLAND-BEAVERTON	9	1		5	6	69	87	12	7	4	13	213
FT CAMPBELL	14			1		64	130			1	2	212
NON-PSA_ILLINOIS	7	2		1		45	133	9	4	1	8	210
NON-PSA_WEST VIRGINIA	24	6		1	2	54	106	9	1		7	210
NH CAMP PENDLETON	9	2		3		63	102	4			25	208
MCCONNELL AFB	17	4		2	1	45	105	4	5	3	15	201
FT GORDON	10	2		2	1	52	93	11	3	5	11	190



Provider Market Area	Bariatric Surgery	Cartoid Arterial Stenting	Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
SOUTHCOM-MIAMI MKT	29	1			52	65	8	6	4	19	184
INDIANTOWN GAP-DEVCCEN BRAC	19	2		5	44	91	5	2	3	11	182
NON-PSA_KENTUCKY	9	2	1	4	52	86	13	5	2	5	179
SELECT-JEFFERSON CITY-COLUMBIA	10	2		1	57	88	10	2	1	5	176
NBHC ATHENS BRAC	15	3	1		52	87	3	2	1	12	176
UT NON PRIME	11			1	52	98		3	1	9	175
NHC NEW ENGLAND	9	8	3		48	91	2	4	1	8	174
KEESLER-GULFPORT MSM	14	4	1	1	46	92	7			7	172
NH OAK HARBOR	1				71	83	5			5	165
NV NON PRIME	10	1	2	1	56	72	4	6		13	165
ABERDEEN PG	14				47	89	5	2		6	163
LEXINGTON BRAC	12	2	1		39	75	6		7	21	163
OR NON PRIME	6	2	1		54	82	3	2		9	159
ND NON PRIME	14	1		1	40	83	6	3	3	4	155
WA NON PRIME	1	4			53	79	3	5	4	5	154
FT SILL	19	5	1	1	39	66	10	4	1	7	153
MAXWELL AFB	1	4	3		38	75	4	4	1	21	151
AZ NON PRIME	2	4			44	89	5	1		3	148
NH BREMERTON		2		1	34	99	3	2		3	144
FT MCCLELLAN BRAC	11	1	1		30	90	4		2	5	144
KS NON PRIME	7	1			48	84	1		1	1	143
FT DETRICK	6	1			51	75	4	3	1	1	142
SELECT-DES MOINES-JOHNSTON	2	1	2	2	46	74	6	1	2	5	141
COLUMBUS AFB	13	1	2		32	75	5	6	1	3	138
NBHC GROTON-USCG NEW LONDON MKT	7				55	66	1	1		8	138
MYRTLE BEACH AFB BRAC	1			1	45	82				7	136
USCG MOBILE	19	5	2	1	19	58	9	8	5	9	135
JBER-ELMENDORF-RICHARDSON	37	1	1	1	37	51	4	1		1	134
GRIFFISS BRAC	14		1	1	42	55	4	9	1	7	134
ID NON PRIME	3			1	43	86			1		134
BEALE AFB	12		1		55	52	1	3		4	128
ELLSWORTH AFB	7	6		2	35	69		1		8	128
IA NON PRIME	7				20	91	5			4	127
OAHU HI	4		2		46	56	6	2	2	7	125
DOVER AFB	16			1	38	52	8	1	2	6	124
IRWIN ACH-FT RILEY	34		1		20	65	1		1	1	123
TYNDALL-PANAMA CITY MKT		5	1	1	27	78	1	2		7	122
SELECT-SD-SIOUX FALLS	5	2		1	36	60	4	4	2	7	121
NHC LEMOORE	13	1	1	1	25	58	4	4	2	12	121
SEYMOUR JOHNSON AFB	27	1	3	3	26	41	10	6		3	120
MO NON PRIME	12	1			22	67	2	3		11	118
NBHC-PORT HUENEME	7	9			34	44	11	3	2	7	117
CORPUS CHRISTI MKT	16	2	1		25	58	4	5		5	116



Number of Surgeries	Column Label	Bariatric Surgery	Cartoid Arterial Stenting	Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
NHCL EVERETT	2	1			2	36	57	5	1		5	109
NBHC SARATOGA SPRINGS	9				1	35	50	4	2		4	105
CO NON PRIME	1				1	31	64				4	101
NBHC BRUNSWICK BRAC	8	1				29	52	2		2	7	101
BRAC NORTON AFB	6	1		1	3	30	40	9	4	3	4	101
ENGLAND AFB BRAC	34	1				16	40	3	2	1	3	100
SELECT-FORT COLLINS-LOVELAND	3					41	49	2			2	97
DYESS AFB		1		1		24	64	4			3	97
CA NON PRIME	1				2	28	50	2	3	1	6	93
RAYMOND W BLISS AHC-FT HUACHUCA						44	47				1	92
NBHC PORTSMOUTH	3	1		3		27	48	6	2		1	91
WHITEMAN AFB	12					19	53				6	90
WEST POINT	4					20	56	4		1	3	88
SELECT-OR-SALEM	3			2		30	49		3			87
WILLIAM BEAUMONT AMC-FT BLISS			3	1	2	26	40	5	4		4	85
FE WARREN AFB	11	3				23	42	3			2	84
SELECT-IOWA CITY-CEDAR RAPIDS	4	1		1		17	49	3	1	4	3	83
NH TWENTYNINE PALMS	4				1	23	43	5	2		4	82
SHEPPARD AFB	10	4				21	45		1		1	82
MALMSTROM AFB	8					26	37	1	1		8	81
NON-PSA_CONNECTICUT	7	1		2	1	18	18	12	6	2	13	80
BRAC REESE AFB	6	2			2	19	42	4		1	3	79
SELECT-OR-EUGENE	1	1				25	42	3		2	4	78
USCG TRAVERSE CITY		1				23	43	2	3		6	78
MOUNTAIN HOME AFB	14				1	19	38	1			3	76
NE NON PRIME	1	2				26	40	3	2		2	76
BRAC CASTLE AFB	6	1		1		19	42	1	1		4	75
ROCK ISLAND AHC	5					17	48		1		4	75
GENERAL LEONARD WOOD ACH						18	52	1			3	74
FT CHAFFEE BRAC	3	3		1		24	34	3	1		4	73
NH BEAUFORT	7	1		3		12	39	7	2		2	73
MOODY AFB	11					19	38				3	71
NON-PSA_MARYLAND	4					17	42	5	1		1	70
GOODFELLOW AFB	7			1	1	13	30	4	8		5	69
NH CAMP LEJEUNE	9	5				10	19	13	2	4	6	68
SELECT-WA-VANCOUVER	3					30	28	3	2		2	68
NHC PATUXENT RIVER	5					18	35			1	8	67
PLATTSBURGH BRAC				2	1	16	30	6	2	2	6	65
SD NON PRIME	3					21	39				2	65
USCG CAPE COD	4					21	36	3			1	65
BRAC WILLIAMS AFB	2	1			1	22	36				1	63
SUGAR GROVE-VINT HILL BRAC	2				1	15	32	7	2		3	62
ALTUS AFB	2					10	44				3	59



Provider Market Area	Bariatric Surgery	Cartoid Arterial Stenting	Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
GLENVIEW BRAC	4		1		18	29	4			1	57
NON-PSA_MAINE	1	3	1		13	23	7	2	1	6	57
VANDENBERG AFB	12			1	16	25	2				56
EAKER AFB BRAC	4	3			10	35	1			2	55
NON-PSA_NEW HAMPSHIRE	1		2	1	17	29	2	1		1	54
TX NON PRIME	8	2			12	28	1	1		2	54
AHC PRESIDIO-MONTEREY	4				21	21	1	2	1	3	53
MCAFFEE AHC-WHITE SANDS MISSILE RANGE	2		1		17	29	1	2			52
NON-PSA_MISSOURI	1		1	3	10	31				4	50
NBHC MERIDIAN	1				5	41	1			1	49
NON-PSA_MASSACHUSETTS	2				15	26	5			1	49
YUMA -YPG AREA	2	3			17	19	2	1		3	47
BMC-SAN ONOFRE	11				16	14					41
USCG-NORTH BEND	2			1	8	24				5	40
KI SAWYER BRAC	1				12	24				2	39
WY NON PRIME	1				8	25		1		3	38
CHANUTE BRAC	1	1	1		7	25	1				36
OR1USCGC-ASTORIA					10	26					36
NM NON PRIME					8	27					35
NBHC ALBANY	1	1	1	1	6	19	2		2	2	35
FT POLK					9	21	1			1	32
EDWARDS AFB	3	1			12	13					29
USCG ATLANTIC CITY	3				7	13				5	28
GRAND FORKS AFB					13	12	2				27
HOLLOMAN AFB				1	6	14				6	27
NON-PSA_VERMONT					4	20	1			1	26
VANCE AFB					4	20					24
USCG ELIZABETH CITY				1	10	13					24
BRAC GEORGE AFB		5			8	9					22
FT WAINWRIGHT-EIELSON					9	12					21
BRAC MCCLELLAN AFB					6	15					21
USCGC-PORT ANGELES					9	11					20
USCGC-PETALUMA	1				4	13					18
RED RIVER ARMY DEPOT BRAC		1			5	9	1	1			17
HI NON PRIME	1				6	5		1	1	1	15
MINOT AFB					7	7	1				15
FT DRUM					2	7	2			3	14
WURTSMITH BRAC					5	8					13
BRAC MARCH AFB					4	9					13
NHC QUANTICO-NBHC DAHLGREN					4	7					11
BRAC RICHARDS-GEBAUR CLINIC MO					2	7	2				11
NBHC-NAVWPNCEN CHINA LAKE					7	3					10
NON-PSA_GEORGIA					3	7					10
BRAC FT HUNTER-LIGGETT					4	4				1	9



Provider Market Area	Bariatric Surgery	Cartoid Arterial Stenting	Complex Aortic Surgery	Esophagus Resections	Hip Replacements	Knee Replacements	Lung Resections	Mitral Valve Repair	Pancreas Resections	Rectum Resections	Grand Total
LORING AFB BRAC					3	5					8
KEY WEST MKT	1				1	4				1	7
FT DEVENS BRAC					4	3					7
AK NON PRIME					1	4					5
LAUGHLIN AFB					2	3					5
BRAC RICHARDS-GEBEUR CLINIC KS					2	1		1			4
USCG JUNEAU NON PRIME					2	1					3
NAVSTA NEW YORK BRAC					1	1				1	3
NBMC-EL CENTRO					1	2					3
USCG KETCHIKAN NON PRIME										2	2
BRAC SIERRA ARMY DEPOT NV						1				1	2
USCG CAPE MAY						2					2
NBHC-NAS FALLON						2					2
CHASE FIELD NAS BRAC						1					1
USCGC-HUMBOLDT BAY						1					1
LETTERKENNY ARMY DEPOT BRAC					1						1
USCG SITKA NON PRIME										1	1
<b>Grand Total</b>	<b>4,110</b>	<b>654</b>	<b>485</b>	<b>451</b>	<b>14,833</b>	<b>25,937</b>	<b>2,030</b>	<b>1,273</b>	<b>699</b>	<b>2,807</b>	<b>53,279</b>

INSIDE BACK





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