Beyond Trauma: High-Volume Critical Care Medicine in a Military Medical Center–Based Military–Civilian Partnership

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ABSTRACT

Introduction:

Critical Care Internal Medicine (CCIM) is vital to the U.S. Military as evidenced by the role CCIM played in the COVID-19 pandemic response and wartime operations. Although the proficiency needs of military surgeons have been well studied, this has not been the case for CCIM. The objective of this study was to compare the patient volume and acuity of military CCIM physicians working solely at Military Treatment Facilities (MTFs) with those at MTFs also working part-time in a military–civilian partnership (MCP) at the University Medical Center of Southern Nevada (UMC).

Materials and Methods:

We analyzed FY2019 critical care coding data from the Military Health System and UMC comparing the number of critical care encounters, the number of high-acuity critical care encounters, and the Abilities/Activity component of the Knowledge, Skills, and Abilities/Clinical Activity (KSA) score. This analysis was restricted to critical care encounters defined by Current Procedural Terminology codes for critical care (99291 and 99292). A critical care encounter was considered high acuity if the patient had ICD-10 codes for shock, respiratory failure, or cardiac arrest or had at least three codes for critical care in the same episode.

Results:

The five AF CCIM physicians in the MCP group performed 2,019 critical care encounters in 206 days, with 63.1% (1,273) being defined as high acuity. The total number of MTF critical care encounters was 16,855 across all providers and services, with 28.9% (4,864) of encounters defined as high acuity. When limited to CCIM encounters, MTFs had 6,785 critical care encounters, with 32.0% being high acuity (2,171). Thus, the five AF CCIM physicians, while working 206 days at the UMC, equated to 12.0% (2,019/16,855) of the total critical care MTF encounters, 27.2% (1,273/4,684) of the total high-acuity MTF critical care encounters, and 29.8% (2,019/6,785) of the MTF CCIM encounters, with 58.6% (1,273/2,171) of the MTF CCIM high-acuity encounters.

The USAF CCIM physicians in the MCP group performed 454,395 KSAs in 206 days, with a KSA density per day of 2,206. In the MTF group, CCIM providers generated 2,344,791 total KSAs over 10,287 days, with a KSA density per day of 227.9. Thus, the five CCIM physicians at the UMC accounted for 19.38% of the MTF CCIM KSAs, with a KSA density over 10 times higher (2,206 vs. 227.9).

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Conclusions:
The volume and acuity of critical care at MTFs may be insufficient to maintain CCIM proficiency under the current system. Military–civilian partnerships are invaluable in maintaining clinical proficiency for military CCIM physicians and can be done on a part-time basis while maintaining beneficiary care at an MTF. Future CCIM expeditionary success is contingent on CCIM physicians and team members having the required CCIM exposure to grow and maintain clinical proficiency.
Limitations of this study include the absence of off-duty employment (moonlighting) data and difficulty filtering military data down to just CCIM physicians, which likely caused the MTF CCIM data to be overestimated.

INTRODUCTION

Critical Care Internal Medicine (CCIM), a subspecialty of internal medicine also available to emergency medicine (EM), is essential to the expeditionary capabilities of the U.S. Military, both at home and abroad, as evidenced by the vital role CCIM played in the recent COVID-19 pandemic response and in wartime operations.[1–4] CCIM in the expeditionary environment is more challenging than hospital-based practice and requires military-specific training and regular participation in the care of a high volume of critically ill patients to ensure full proficiency.[5,6] Military CCIM physicians, however, are typically assigned to Military Treatment Facilities (MTFs), which generally have a low volume of low-acuity patients, or to operational units where clinical activity is sporadic and cumulatively inadequate.[7] Skills in CCIM are occasionally overlooked as being crucial to the expeditionary scope of military practice, but they are in fact foundational to the military continuum of care. CCIM is deployed in the expeditionary environment to care for casualties who have undergone damage control resuscitation and surgery, management of traumatic brain injury, and to lead Critical Care Air Transport Team (CCATT), not to mention pandemic and emergency response. Additionally, when considering a future operating environment that may have delayed evacuation and prolonged hold times, critical care becomes an invaluable skill set for Role 2 and even prehospital providers.[8]

Military–civilian partnerships (MCPs) have proven crucial in ensuring Military Health System (MHS) surgeons and their teams have the required operative volume and case complexity to sustain competency during peacetime and ensure proficiency in caring for patients in the expeditionary environment; however, there has been minimal focus in the MHS on integrating nonsurgeons into MCPs or assessing military CCIM proficiency.[9–11] Recognizing that CCIM physicians and their teams encounter the same difficulties as surgeons do in maintaining clinical proficiency at MTFs, the U.S. Air Force (USAF) has begun to expand its concept of MCPs to include CCIM.[12] The first and principal site of this expansion is the Las Vegas military–civilian partnership (LV-MCP) centered on Nellis Air Force Base and the Mike O'Callaghan Military Medical Center (MOMMC).[8]

The LV-MCP is a full spectrum collaboration among the USAF, Las Vegas Veterans Affairs (VA) hospital, multiple civilian health care entities, and the Southern Nevada Healthcare District; this collaboration began in 2003 and has been described in detail elsewhere.[8] The value of these integrated full spectrum programs does not just increase provider or medic readiness, but they meet the needs of the community and improve trauma and Emergency Medical Service system capability and capacity.[12] CCIM began its integration into the LV-MCP in 2011 with the formation of a joint VA and USAF CCIM department. In 2015, a CCIM physician was assigned to a newly developed program that integrated USAF medical personnel with the University Medical Center of Southern Nevada (UMC) and the Kirk Kerkorian School of Medicine at University of Las Vegas, Nevada (KSOM). Subsequently, additional CCIM providers were added, and a pulmonary and CCIM fellowship program was started. The success of CCIM has paved the way for other specialties that are critical for expeditionary medicine, including respiratory therapists (RTs), ICU nurses, and acute care nurse practitioners. (Supplementary Appendix S1).

As with early surgical experiences, measuring the objective benefit of integrating CCIM into MCPs has been challenging, as much of the readiness and clinical value is not easily quantified. Historically, adequate CCIM patient volume and case mix has been estimated from many different measures, such as relative value units, service-specific skills checklists, and the amount of time scheduled in an MTF ICU, none of which have proven satisfactory.[13,14] More recently, the Knowledge, Skills, and Abilities/Clinical Activities (KSAs) construct and Clinical Activity Score (CAS), initially developed by the surgical community to more objectively quantify what it means to be prepared for deployment, has been extended to CCIM. The Knowledge score component of the KSAs is determined by objective testing, whereas the Skills are evaluated during simulations and formal courses, and the Abilities/Clinical Activities are quantified by the CAS. The KSA CAS methodology, which has not been previously published, was produced by senior clinical specialty leaders in each field by first identifying and listing critical skills in the expeditionary scope of practice (Supplementary Appendix S2). Current Procedural Terminology (CPT) and ICD-10 codes for critical care were then identified and linked to these skills by a group of MHS clinical leaders. The point value assigned depends on how many skills each CPT or ICD-10 is linked to (Supplementary Appendix S3). The CAS is ultimately used to compare each provider to a cumulative target threshold, set by MHS CCIM leadership, which is believed to represent ongoing clinical proficiency and indicate expeditionary competency.[13] It is

worth noting that although the CAS of the KSAs has not been prospectively validated for this purpose, they are nonetheless the clinical benchmark currently used by the MHS to quantify clinical exposure.

We hypothesized that integrating CCIM physicians into a mature MCP would result in high-volume, high-acuity clinical experiences that are relevant to expeditionary medicine as measured by the CAS. We also explored an alternate measure of CCIM clinical proficiency using time-based CPT codes, which demonstrate care of critically ill patients irrespective of procedural intervention, as perhaps a more meaningful marker of CCIM exposure.

MATERIALS AND METHODS

Data Source and Study Population

We analyzed data from two sources for this study. Information on care provided in the MTF group comes from the Military Health System Management Analysis Reporting Tool (M2). The M2 is a centralized data repository integrating MHS health care data worldwide, including encounter data from the electronic health records (EHRs) in MTFs as well as health care claims from contracted civilian providers. We used data from fiscal year (FY) 2019, which predate the COVID-19 pandemic, in order to capture steady-state operations within the MHS. We also used this time period to avoid any widespread impacts to data capture that result from the deployment of MHS GENESIS, DoD's new EHR. One medical center in the Pacific Northwest was directly affected by converting to MHS GENESIS. For this site, we used FY 2016 data, which predated the deployment of the new EHR in that location and added it to the FY 2019 MTF data. For the MCP group, we again chose FY 2019 for a direct comparison of the care provided by the five USAF CCIM physicians (one ER-CCIM and four Pulmonary CCIM). Data covering care provided in civilian partner facilities come directly from billing data generated by the KSOM. Data between civilian and MHSs are largely comparable, as both are claims-like in nature and contain similar information. Because we used de-identified data, we were unable to determine the physician specialty for each critical care encounter with M2 in the MTF group. We were able to look at MTF total critical care coding, irrespective of specialty and then by using the Medical Expense and Performance Reporting System (MEPRS), which assigns encounters based on the environment the care was delivered in rather than the provider.[15] We were able to exclude MEPRS codes that were obviously not CCIM while including all possible CCIM encounters by including internal medicine and all subspecialty areas (Supplementary Appendix S4). This eliminated specialties such as surgery, EM, and anesthesia from the MTF CCIM analysis to allow a more direct comparison of MCP CCIM to MTF CCIM.

We compared results from the MCP to the whole MHS and the two flagship MTFs (San Antonio Military Medical Center and Walter Reed Military Medical Center), as well as the co-located MOMMC at Nellis AFB in Las Vegas.

TABLE I. Critical Care Encounters at Military–Civilian Partner and Military Treatment Facilities

	Critical care encounters	Share high acuity
LV-MCP CCIM	**2,019**	**63.05%**
MTF—All Critical Care	**16,855**	**4,864 (28.86%)**
SAMMC	5,633	2,066 (36.68%)
WRNMMC	750	98 (13.07%)
MOMMC	173	64 (36.99%)
MTF CCIM	**6,785**	**2,171 (32.00%)**
SAMMC	2,365	882 (37.30%)
WRNMMC	252	47 (18.81%)
MOMMC	86	55 (63.93%)

Abbreviations: CCIM, Critical Care Internal Medicine; LV-MCP, Las Vegas military–civilian partnership; MOMMC, Mike O'Callaghan Military Medical Center; MTF, Military Treatment Facility; SAMMC, San Antonio Military Medical Center; WRNMMC, Walter Reed National Military Medical Center.

Comparing the total critical care encounters from any specialty, CCIM encounters, and percentage of high-acuity encounters at the SAMMC, WRNMMC, and MOMMC to the LV-MCP CCIM encounters.

Outcome Variables of Interest

This analysis was restricted to critical care encounters defined by CPT codes for critical care (99291 and 99292). To provide a better picture of the clinical substrate available across practice locations, we created a dichotomous measure of high-acuity encounters. A critical care encounter was considered high acuity if the patient was in shock, respiratory failure, or cardiac arrest or had at least three codes for critical care (99291) in the same episode (Supplementary Appendix S5). In addition, we calculated KSA CASs for both the direct care and civilian partner workloads using the current KSA CAS algorithm for CCIM (Supplementary Appendix S2).

RESULTS

As seen in Table I, the five USAF CCIM physicians in the MCP group performed 2,019 critical care encounters in 206 days, with 63.1% (1,273) being defined as high acuity. The total number of MTF critical care encounters was 16,855 across all providers and services, with 28.9% (4,864) of encounters defined as high acuity. When limited to CCIM encounters, MTFs had 6,785 critical care encounters, with 32.0% being high acuity (2,171/6,785) spread out among 106 providers. Thus, the five USAF CCIM physicians, while working 206 days at the UMC, equated to 12.0% (2,019/16,855) of the total critical care MTF encounters, 27.2% (1,273/4,684) of the total high-acuity MTF critical care encounters, 29.8% (2,019/6,785) of the MTF CCIM encounters, and 58.6% (1,273/2,171) of the MTF CCIM high-acuity encounters.

TABLE II. KSA-Based Measures of Workload and Clinical Density

	Total KSAs	Total clinical days (12-hour shifts)	Number of providers	KSA density per provider	KSA density per clinical day
LV-MCP CCIM	454,395	206	5	90,879	2,206
MTF CCIM	2,344,791	10,287	106	22,121	227.9

Abbreviations: CCIM, Critical Care Internal Medicine; KSA, Knowledge, Skills, and Abilities/Clinical Activity; LV-MCP, Las Vegas military–civilian partnership; MTF, Military Treatment Facility.
Comparing the KSA score between the LV-MCP and all MTF CCIM encounters.

In Table II, the USAF CCIM physicians in the MCP group achieved a KSA CAS of 454,395 over 206 days, with a KSA CAS density per day of 2,206. In the MTF group, the 106 CCIM providers generated a KSA CAS of 2,344,791 over 10,287 days, with a KSA CAS density per day of 227.9. Thus, the five CCIM physicians at the UMC accounted for 19.38% of the MTF CCIM KSAs, with a KSA density over 10 times higher (2,206 vs. 227.9).

DISCUSSION

The relationship between clinical exposure and proficiency maintenance is logical but unproven, and clinical outcomes related to exposure volume have not been demonstrated for CCIM. There has been a great deal more emphasis on examining this relationship for military surgeons, but a clear relationship has not been defined.[16] However, it seems highly likely that the lack of day-to-day exposure to high-acuity CCIM may have negative repercussions on future battlefield and non-battlefield expeditionary missions.[13,17] The critical care KSA CAS is the current MHS metric for measuring this exposure and operates by linking ICD-10 and CPT codes to skills thought to be essential to expeditionary critical care, which can be quite subjective. For example, a "Fracture of shoulder and upper arm "and" open wound of elbow and forearm" (neither of which in isolation would be expected to require ICU admission) are both scored 132 points, although cardiac arrest scores only 60 and eclampsia only 51 because the former injuries were able to be linked to a greater number of critical expeditionary skills than the latter, regardless of acuity or importance to CCIM (Supplementary Appendix S3). This study evaluated an alternative algorithm, which like the CAS is calculated by CPT and ICD-10 codes. Although procedural and patient volume is undoubtedly important for CCIM, capturing it in respect to patient acuity is challenging; often CCIM providers perform procedures that are not associated with critically ill patients and rarely require the complex decision-making and longitudinal care seen in surgical procedures. Our alternative algorithm, therefore, is focused on CPTs for critical care time, which by definition requires a patient to be critically ill with the direct intervention of the CCIM physician.[18] Focusing on CPTs for critical care in the CAS algorithm and limiting the weight of many procedures/encounters which frequently take place outside of the critical care environment would likely produce a more accurate metric for CCIM exposure required for successful expeditionary practice. Although this approach may miss the readiness value of some non-critical care encounters, it ensures that what is captured is high value, and thresholds for deeming adequate critical care exposure can be targeted with this in mind. Further studies are needed to validate this approach.

Establishing target metrics in the context of high-acuity critical care patients better targets the types of encounters the MHS desperately needs for CCIM proficiency. We found that the MCP group produced approximately 60% of high-acuity encounters compared to the MTF group but 20% of the KSAs; this finding suggests that much of the KSAs at MTFs are not associated with the high-acuity patients needed for CCIM skills growth and sustainment. When scheduling is taken into account, that workload was generated through only 206 shifts. This approximately equates to 0.25 full-time equivalents (FTEs) at the MCP per CCIM provider (3-4 shifts per month assuming one FTE is 15 shifts per month) or 1.25 total FTEs. Using our alternative algorithm, we are able to highlight the disparity in exposure to CCIM between LV-MCP and even the largest MTFs. We also demonstrated that the volume and acuity of care provided through the MCP are vastly greater, even in part-time status.

Challenges for Military Critical Care Medicine

The most obvious and glaring impediment to increasing skills maintenance opportunities for military CCIM physicians are the lack of high-acuity/complexity patients in the MHS and a lack of MCP opportunities.[19] To be good at CCIM, one must do CCIM. Two substantial barriers to improving both of these efforts are strategic geographic requirements and personnel. The MHS has a unique requirement to provide health service support to DoD strategic areas, regardless of geographic location and constraint. This requirement results in substantial trauma-based, ready resources on standby, in a position to quickly react to urgent medical needs but not medically fully engaged on a regular basis. In other words, military ICUs exist out of strategic necessity and not out of current patient demand. As such, military CCIM physicians support resource-poor ICUs under a high-intensity staffing model, with excessively low or no patient census and limited or no opportunity to form MCPs.

The MHS has many challenges when comparing the delivery of CCIM to what the civilian sector can provide. The

active-duty patient population is relatively healthy and the beneficiary care to the retiree population has been actively outsourced to civilian hospitals since the inception of the TRICARE program and subsequent the Defense Health Agency transition. This is compounded by nursing and support staff shortages partly because of a prioritization of operational mission requirements over, and a lack of redundancy in, MTF staffing. Inconsistent capability and capacity make MTFs less effective in maintaining and recapturing the MHS beneficiary population.

The MHS suffers similar attrition of highly skilled multidisciplinary team members as our civilian counterparts, aggravated during the COVID-19 pandemic.[20] A lack of CCIM practice opportunities at MTFs, pay disparity, and high operational tempo coupled with inconsistent opportunities to employ the critical care skill set during deployments all contribute to CCIM physician attrition.[21] Across the spectrum, military CCIM physicians note dissatisfaction with their practice, adding an additional contributor to accelerated attrition.[22] As end-strength numbers decline, and strategic geographic locations continue to maintain required manning, CCIM physicians will be incrementally diverted away from the busier MTFs.

The Army, Navy, and Air Force have all embraced the capability that CCIM brings in the expeditionary setting. The USAF has focused on expanding CCATT and expeditionary capabilities. Critical Care Air Transport Team deployments with CCIM physicians include combat support, COVID operations, and other contingency operations, including dependent patient movement on a more frequent basis outside the continental United States. It is anticipated that CCATT will play a more substantial role in future operations where the transport environment might evolve more into the initial care environment and support prolonged casualty care. Navy CCIM deployed extensively in support of COVID is expanding its operational role to include support of Expeditionary Medical Unit teams capable of providing specialty care on newly constructed high-speed, shallow draft ships (T-EPF Flight 2 ships). The Army CCIM community participated extensively in COVID operations and is significantly involved in adding capacity for CCIM to restructure medical field units and pushing technology to support prolonged field care further forward toward the battlefield point of injury. It is essential that in preparation for the future operating environment that CCIM capabilities get sustained and expanded to meet the needs of the future battlefield which will likely be characterized by prolonged hold times and the need for critical care skills during evacuation. Further defining the role of the expeditionary CCIM physician and clarifying the most strategic use of their wartime critical skill set should more correctly align operational requirements with practice opportunities.

Opportunities for Military Critical Care Medicine

The MHS has several potential paths to remove barriers for the full spectrum practice of CCIM by its multidisciplinary teams. First, the MHS should build and expand complex critical care programs at MTFs by increasing beneficiary care and treatment of select civilian patients and collaborating with busy VA critical care facilities. Next, the MHS should utilize existing technology to push CCIM coverage forward and to maximize efficiency without sacrificing practice opportunities. Finally, perhaps the most viable and durable path is to create more MTF-centered MCPs like the LV-MCP.

In an effort to provide CCIM expertise to smaller hospitals, capitalize on economies of scale, and strategically leverage a limited supply of CCIM physicians, the Joint Tele-Critical Care Network (JTCCN) was created in 2014 and has since grown to support over 16 service MTFs across the world. The use of JTCCN by MTFs has provided an increase in patient complexity, hospital volume, and surgical volume with case variety while reducing costs.[23–25] Continuing to support the growth and reach of JTCCN by establishing additional hubs at major MTFs and providing services to additional smaller MTFs will allow for the concentration of CCIM physicians at busier MTFs, with manning at smaller hospitals accomplished with non-CCIM physicians.

Concentrating CCIM physicians at major MTFs will facilitate both the first and third opportunities for improvement, build and expand complex critical care programs at MTFs and form complex MCPs. The integration of CCIM physicians into MCPs, while extremely common in the surgical community, is not a widespread practice. Of 87 identified MCPs, four, all USAF, involve CCIM.[11] Our study demonstrates that significant measurable critical care exposure can be achieved by participating in MCPs, even on a part-time basis. Opportunities exist for MCPs to develop near every major military MTF, and focusing on recruiting and training physicians in CCIM will ensure that sufficient CCIM assets are available to both sustain MCPs and support the MTFs for future expeditionary missions.

MCPs, while often described as unidirectional, can and should be bidirectional where geographically feasible with care for critically ill and trauma civilian patients at MTFs combined with integrating military medical personnel in large and complex civilian hospitals.[8] Although placing critical care personnel outside of MTFs is absolutely essential to augment clinical currency, it cannot replace the full spectrum of readiness that can occur at a military medical center staffed and run by military personnel.[8] Ideally, this would consist of a combination of beneficiary recapture and critically ill civilian patients that would allow for the volume and acuity required to sustain complex critical care programs such as Extra Corporeal Membrane Oxygenation, pediatrics, trauma, burn care, and others. Section 717 of the 2017 NDAA authorizes the DoD to care for civilian and VA patients if "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".[26] This and Secretary Designee authority are the two mechanisms whereby civilian patients

may access an MTF. Although neither are specific to types of patients, the utilization has historically been limited to trauma. However, as data show that nearly 50% of patients medically evacuated from combat theaters are for non-traumatic medical illnesses and the ongoing COVID-19 pandemic has demonstrated the need for full spectrum military critical care, caring for civilian non-trauma critical care patients at MTFs would significantly augment CCIM readiness.[2,3]

A final key component of MCPs is the benefit to the civilian population and the overall trauma system. For the civilian medical system, MHS CCIM plays a vital role in All Hazards Pandemic Response, Emergency Care System, and the National Disaster Medical System. Pre-existing integration of military CCIM physicians with MCPs brings familiarity with civilian practice and allows civilian institutions in turn to be familiar with military personnel.[10]

CCIM in the LV-MCP owes its existence largely to the collaboration with surgical specialties at the MOMMC and at the MCP. By sharing capabilities, relationships, and administrative resources, practice opportunities have increased for all involved services. To this end, the LV-MCP serves as a model for the MHS in MTF-centered sustainment, with medics from the MOMMC working clinically in MTF and MCP environments. The significant additional exposure to high-acuity, complex, critically ill patients with just partial FTE in the MCP has allowed physicians to remain clinically active at the highest level while remaining embedded in their expeditionary teams and providing beneficiary care at the MTF.

Limitations of this study include the absence of off-duty employment (moonlighting) data for MTF-based providers that likely contribute to the maintenance of CCIM proficiency. Also, M2 data could not be filtered down to just CCIM physicians. Data from trauma physicians, emergency physicians, and potentially other providers contributed to the combined MTF data. MTF CCIM data were derived from MEPRS codes, which almost certainly included non-CCIM physicians and likely artificially increased the values for MTF CCIM data. Finally, our definition of high-acuity critical care encounters was inherently subjective, future analyses might also include 99292, which signifies critical care time greater than 74 minutes, as another indicator of high-acuity critical care.

Although the competency of ICU nurses, RTs, and medical technicians is equally important and undoubtedly benefit from MCP exposure, non-physician workload data are much more challenging to extract. Currently, the MHS relies on self-reporting or other manual data entry from individual medics, a practice that is fraught with inaccuracies. Although the experiences of non-physician health care team members can be extrapolated from the CCIM physician experience, further work must be done to better quantify and qualify the clinical exposure of multidisciplinary ICU team members at MTFs and MCPs.[13]

CONCLUSION

With the worst of the COVID-19 pandemic hopefully behind us, and with military operations shifting focus, it makes sense to take a deeper look at the skills development and skills retention of military CCIM physicians. Our study clearly identifies a marked difference between traditional MTF–based practice and combined MTF-MCP-based practice. Barriers with respect to personnel and geographic assignments have been identified. Solutions must include building on the complex programs and services already offered (CCATT, pediatrics, Extra Corporeal Membrane Oxygenation, and burn ICU), leveraging current technology as a CCIM force multiplier (JTCCN), and identifying opportunities to partner with our civilian colleagues, the VA, and build multifaceted MCPs. Employing integrated models for sustained readiness by partnering MTFs with high-volume civilian organizations and teaching programs clearly increases practice opportunities for military CCIM physicians. In specific geographic locations, these platforms not only maintain valuable MTF operations, but they also improve system trauma capability and capacity and improve disaster preparedness. Modifying the CAS algorithm to incorporate critical care encounters will better demonstrate readiness across the system of expeditionary scope of practice. Future studies should focus on investigating the relationship between clinical exposures defined by the KSA CAS and patient-centered outcomes, the efficacy of data capture methods and their relevance to expeditionary care, and analyzing the efficiency and cost-effectiveness of standalone MTFs and different types of MCPs.

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SUPPLEMENTARY MATERIAL

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CONFLICT OF INTEREST STATEMENT

The authors have disclosed that they do not have any potential conflicts of interest or financial disclosures.

DATA AVAILABILITY

The data underlying this article will be shared on reasonable request to the corresponding author.

CLINICAL TRIAL REGISTRATION

None declared.

INSTITUTIONAL REVIEW BOARD (HUMAN SUBJECTS)

The Defense Health Agency Electronic Institutional Review Board #22-16720 determined this study to be EXEMPT from DoD regulation 32 CFR 219 regarding the protection of human subjects (32 CFR 219.104(d)(4) Secondary Research for Which Consent Is Not Required) November 28, 2022. This study was conducted in accordance with the Helsinki Declaration.

INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

Not applicable.

INSTITUTIONAL CLEARANCE

Institutional clearance approved.

INDIVIDUAL AUTHOR CONTRIBUTION STATEMENT

J.L. and W.P.L. collected and analyzed the data. J.P.K. and S.M.S. participated in all aspects of manuscript compilation, data analysis, editing, and designing the research. C.A.M., S.P.P., J.M.G., A.H., B.D., and R.G.K.M. participated in draft design and critical interpretation. J.J.C., R.I.M., T.P.L., R.J.W., B.D.S., S.N.D., and E.T.M. participated in critical interpretation. J.B.S. and J.M.G. provided strategic guidance and manuscript review. All authors read and approved the final manuscript.

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