OPEN

Providing Remote Aid During a Humanitarian Crisis

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ABSTRACT: Humanitarian crises create opportunities for both in-person and remote aid. Durable, complex, and team-based care may leverage a telemedicine approach for comprehensive support within a conflict zone. Barriers and enablers are detailed, as is the need for mission expansion due to initial program success. Adapting a telemedicine program initially designed for critical care during the severe acute respiratory syndrome coronavirus 2 pandemic offers a solution to data transfer and data analysis issues. Staffing efforts and grouped elements of patient care detail the kinds of remote aid that are achievable. A multiprofessional team-based approach (clinical, administrative, nongovernmental organization, government) can provide comprehensive consultation addressing surgical planning, critical care management, infection and infection control management, and patient transfer for complex care. Operational and network security create parallel concerns relevant to avoid geolocation and network intrusion during consultation. Deliberate approaches to address cultural differences that influence relational dynamics are also essential for mission success.

KEYWORDS: conflict; disaster; humanitarian aid; surgical telementoring; telemedicine

TO THE EDITOR:

Humanitarian crises may be natural or man-made (1, 2). The current war in Ukraine is a humanitarian crisis that has inspired medical and nonmedical individuals to render aid. While many desire to provide in-person aid, a substantial portion of that aid has been delivered remotely. Remote-only aid is commonly driven by various factors, including military conflict, site access, and safety concerns. Aid requests may flow from individuals, governments, healthcare facilities, or medical professional organizations (MPOs) via disaster portals that help individuals remotely contribute to relief efforts. Herein, we detail the enablers, barriers, and key outcomes of a remote humanitarian aid program.

UNDERSTANDING THE MISSION

It is imperative to understand what those impacted by a humanitarian crisis desire and need, as the two may harbor dissimilar elements. Potentially desired facility-based healthcare-relevant aid may be grouped into five domains (cognitive, technical, educational, supplies, and advocacy). The first four readily fall within the purview of health systems and facilities interested in providing humanitarian aid. Advocacy is better aligned with federal resources and to a lesser extent, certain MPOs. Understanding desired aid specifics helps both frame the remote aid approach structure and avoid the “seven deadly sins of humanitarian aid” (3). Our system was approached by a purpose-built Non-Governmental Organization to help a Ukraine facility-based team navigate decision-making,

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KEY POINTS

Question: What are the key considerations in constructing a remote humanitarian aid program.

Findings: The method of creating a remote aid program aligns mission needs with consultative resources including staffing, educational materials, and technologic aids. Translation services and a data management plan are essential considerations. Network security, personnel safety, and operational security must be similarly managed. Nonrotating multiprofessional consultative personnel help establish personal relationships that enable trust and ideal interpersonal dynamics.

Meaning: A remote humanitarian aid program can substantially improve the care of war injured individuals and provide unanticipated personal reward for team members who seek or render aid.

critical care and operative management for injured combatants and civilians. Understanding the required aid informed consulting team membership and structure.

PROGRAM STRUCTURE

Key team members for this collaboration included clinicians, administrative support staff, liaisons, and information technologists. A mobile liaison to interface with humanitarian aid agencies within Ukraine was essential. In much of the European Union, unlike the United States, trauma care is initially rendered by orthopedic surgeons. Therefore, a group of U.S. Trauma, Orthopedic, and Plastic surgeons who were used to working as a team was supplemented by an infectious disease (ID) specialist and a radiologist based on anticipated consultative needs. Based upon the need to inspire trust and provide experience-driven recommendations, all consulting faculty were senior clinicians. Essential administrative tasks included crafting a consultative schedule, establishing the scope of aid services, and creating a database to facilitate care and project evaluation. Translation between English and Ukrainian initially occurred via a bilingual clinician. Data management became a key task once consultative services launched.

DATA AND PLATFORMS

Teams were linked using digital platform technology for individual communication (WhatsApp LLC, Menlo Park, CA) and group discourse (ZOOM). Data were shared via uploaded media (WhatsApp) or screen-sharing (ZOOM, Denver, CO). A minimal data set (date, time, participants, patient data, Ukraine team questions, consultant recommendations) was replaced by an expanded one with data storage within an encrypted University-based portal supported by MS Excel and Research Electronic Data Capture (REDCap; Vanderbilt University; Memphis, TN) databases for analysis. These digital tools allowed image review (plain radiograph, CT scan, intraoperative image) during conferencing and off-line. Patient data were stored within the portal but were otherwise devoid of personally identifiable information (4). Treating Ukraine physicians and facilities remained anonymous to support operational security (OpSec) (5).

ENABLERS

A variety of interlinked factors enabled consultative partnership success. Starting with only one facility matched Ukraine clinician needs with consulting faculty expertise. Focusing on one discipline (orthopedic trauma) helped the consulting team understand critical elements of Ukrainian practice, patient flow, resources, and the required support. Several consulting faculty possessed austere environment medicine experience (military, law enforcement, disaster management) that helped identify essential patient management approaches to deploy. Relatedly, the consulting faculty practiced within a high-fidelity, mature, level 1 urban trauma center that routinely cares for patients with complex penetrating injuries. That the initial two routinely engaged Ukrainian clinicians were English-language competent (none of the consulting faculty was Ukrainian capable) supported complex management discussions. Finally, the equipment required to manage most of the encountered injuries was already in place in the Ukraine. Nonetheless, several barriers need to be surmounted.

BARRIERS

Barriers may be grouped into three domains: patient information, evaluation and care, and technical elements. Because patients were typically initially treated at a facility closer to direct conflict zones, consultation for resuscitative care was less common. Instead, reconstructive management was prioritized. Due to patient volume, many who underwent single procedure definitive care were transferred to another facility, impeding follow-up and outcome assessment. For those who required serial interventions, the lack of unique identifiers made linking initial information and subsequent data difficult during consultations commonly separated by 2 or more weeks. Evaluation and care barriers spanned the availability of diagnostic tools (therapeutic agent concentration determination), to supplies (antibiotics, implants), and Ukraine consultative specialists (e.g., ID, rehabilitation medicine, plastic surgery). Additionally, input from other team members (e.g., Critical Care Medicine [CCM], nephrology) was more remote than is typical in the United States for those with concomitant critical illness. The absence of that input impeded understanding the safety of recommending complex care approaches within resource constraints. Finally, based on the perceived value of the consultation program, requests for consultation for other services within the initial facility—and the desire for similar consultation in another facility—rapidly surfaced. Some of these barriers were overcome with targeted interventions.

SOLUTIONS

Four approaches helped address care barriers: mission expansion, supply acquisition and delivery, skill set enhancements, and educational material curation. Mission expansion required recruiting faculty from other disciplines, creating a second trauma-focused team, and scheduling additional sessions. The need to coordinate across consults about issues, (particularly supplies) benefitted from regular linkage between two U.S. administrative leaders (Chief Medical Officer and administrative liaison) and one Ukraine administrative liaison. Supplies were acquired from the health system as well as from corporate donors. Skill sets were improved using in-person microsurgical training courses (one in Germany and one in western Ukraine) led by a team of microvascular reconstructive surgeons who also provided remote on-demand surgical telementoring (WhatsApp video, Rods&Cones, Amsterdam, The Netherlands telepresence eyewear) (6). Cognitive and technical skills were underpinned with translated manuals, technique videos, course weblinks, and clinical care publications—none of which previously existed in the Ukraine clinician's armamentarium. Remote contact required maintaining OpSec—a non-native civilian practice consideration.

TELEMEDICINE OPERATIONAL SECURITY

OpSec ensures that the identity and location of both parties, and shared content remain undiscoverable and inaccessible by outside parties. Employing a virtual private network with encryption helps foil network intrusion and geolocation. Geolocation is essential to avoid so that facilities, transport routes, and individuals are not identifiable to avoid specific targeting. Earth orbit imaging (i.e., Google Earth) provides both curated static and live images in an on-demand fashion. Satellite-based connectivity can be leveraged when the usual internet access is inaccessible. While not a typical concern during civilian consultation—despite the well-characterized risk of hospital violence—Ukraine surgeon family member safety is a related essential (7). Recognizing that a fixed consultative time increases discovery risk, the value of enhanced patient care outweighs that risk provided that OpSec is prioritized. Assessing care and outcome data became the next imperative.

DATABASE

Due to time pressure for the program launch, the initial collaboration occurred without databasing or providing a durable record that Ukrainian surgeons could access. Furthermore, all consultations occurred using only static images that were obtained using smartphone camera image capture. Therefore, the Ukrainian team needed to recall or scribe recommendations but could not review recommendations generated by the remote consultants if care occurred in a delayed fashion. Some of these difficulties were addressed using twice per week consultation so that unclear elements could be reviewed. Using digital storage platforms and screen sharing improved image quality and curation. Databases, including Excel (Microsoft Corporation; Redmond, WA) and REDCap, aided analysis of patient volume, care questions, and categories of recommendations. More difficult was linking patient data—especially images—across multiple consultation episodes as data existed within ZOOM, WhatsApp, Excel, and REDCap. The severe acute respiratory syndrome coronavirus 2 pandemic driven National Emergency TeleCritical Care Network (NETCCN) platform offered a viable solution for data curation and analysis (8).

NATIONAL EMERGENCY TELECRITICAL CARE NETWORK

NETCCN offers a cloud-based, stand-alone, electronic health record agnostic platform that is critical care focused and reflects public-private partnership development. It provides a comfortable chart-type layout without requiring hardware installation or prior relationships between facilities or consultants. The platform links clinicians across devices (smartphone, tablet, laptop, desktop) using a web portal or a downloadable application (9). The company that provided aid (Omnicure Now; St. Louis, MO) is one of three with NETCCN functionality; aid and resources were donated to support humanitarian relief efforts.

OpSec was supported by establishing generic identities for Ukraine clinicians (Ortho 1, Ortho 2, etc.), while U.S. clinicians' identities were used to facilitate directed consultation in a one-on-one on-demand fashion. The platform was revised to embed ZOOM to support single portal consultation. Using a single platform would leave each patient record "open" until care completion and help ensure that entered images and data were sequenced correctly and tied to specific recommendations. Given Ukraine surgeon workflow, data upload was shouldered by administrative staff or consulting faculty. Surgical telementoring could occur within NETCCN but would require an assistant operated hand-held device, or a fixed-arm mount to ensure operative field sterility. NETCCN use barriers were related to the lack of: 1) surgical patient-appropriate headings (as opposed to CCM-relevant fields) and 2) embedded English-Ukrainian translation. While platform revision costs are relatively minor, consulting clinician and administrator costs may be substantial.

FACULTY AND EFFORT ANALYSIS

The number of physicians involved in consultation increased over time, reflecting the addition of a second facility (**Table 1**). Each durable consultative team included one orthopedic surgeon, one orthopedic or plastic reconstructive surgeon, and two trauma surgeons anchored by one administrator and an ID specialist; the administrator and ID physician participated in both teams to maintain continuity. The consultative team at the initial facility included a Radiologist for the majority of the year but was supplanted by local radiology analysis. Recognizing that the financial cost for physician and administrator time varies between institutions and regions, consultative time commitments were assessed as full-time employee (FTE) equivalents. Over the initial year, services were distributed across two facilities. The first facility engaged for 52 weeks while the second one engaged for 40 weeks. Over those time frames, the combined clinician FTE equivalent during consultation was 0.46 while the administrative FTE equivalent was 0.069 (based on a 2080 hr work year). This assessment does not capture the administrator's time spent in coordination or data management and will therefore underestimate the administrative time burden. Clinician time is also underestimated as time spent in travel and teaching during the microsurgical training courses is not included in the remote aid analysis. Relatedly, the time assessment does not include that of the Ukraine embedded administrative liaison, as the consulting facility did not fund that individual. Remote consultation engenders substantial time and financial burdens offset by a host of rewards.

PATIENT CARE DATA

The combined teams engaged in 187 consultation sessions, evaluating 271 unique patients, each of whom required surgical management. Consultation led to recommendations regarding timing and sequencing of therapy (100%), management of the soft tissue envelope (100%), the choice of reconstructive approach (100%), antibiotic therapy (67.8%), organ failure management (28.7%), nutritional support (45.7%), and rehabilitation approaches (92.2%). Seven patients demonstrated injuries that required microvascular reconstruction and were cared for in a combined fashion at the hospital that hosted an in-person microvascular course (eight operations with five free flaps). Sixteen Ukraine surgeons have been trained in microvascular reconstructive techniques in the two in-person courses.

UNEXPECTED OUTCOMES

While remote aid was anticipated to be less personally engaging and rewarding than in-person aid,

TABLE 1.
Consultative Personnel Commitment Over Time

Facility 1, April 29, 2022, to April 25, 2023					
Type	***n***	**Hr/Wk**	**Wk**	**Total Time (hr)**	**FTE Equivalent**
Orthopedic/orthoplastic surgeon	2	2	52	204	0.098
TR/SCC/ESS	4	2	52	416	0.2
ID	1	2	52	104	0.05
Radiology	1	2	37	74	0.036
Administrator	1	2	52	104	0.05
Subtotal					*0.434*
Facility 2, August 1, 2022, to May 1, 2023					
Type	***n***	**Hr/Wk**	**Wk**	**Total Time (hr)**	**FTE Equivalent**
Orthopedic/plastic Surgeon	2	2	40	80	0.038
TR/SCC/ESS	1	1	40	40	0.019
ID	1	1	40	40	0.019
Radiology	0	0	40	0	0
Administrator	1	1	40	40	0.019
Subtotal					*0.095*
Total					**0.529**
Physician only total					**0.46**

FTE = full-time employee, ID = infectious disease physician, TR/SCC/ESS = trauma/surgical critical care/emergency surgery service surgeon.
The addition of each service or facility reflects an incremental increase in personnel and their time commitment during consultative events. Time spent outside of planned consultation is not included.
FTE calculation is based on 2080 hr/yr.
Boldface font represents totals.

this assumption was inaccurate. The United States principally relies on low-context relationships, but many other countries, including Ukraine, demonstrate high-context relationships (10). Recognizing that dimension, the accumulated hours spent with the Ukraine clinicians forged bidirectional personal bonds. Shared experiences were augmented by learning of each other's families, hopes, and dreams framed by consultative delays and interruptions from air raid warnings, internet outages, and local power grid failures. Regardless, remote aid fulfilled the need to help during a humanitarian crisis. One aspect of that help was witnessing our Ukraine colleagues' cognitive and technical growth that surpassed their initial and well-developed skill sets. Such rapid growth meets an essential aspect of the academic mission—enabling professional growth. Indeed, our Ukraine colleagues brought a growth mindset to the remote aid mission. Furthermore, the strength of these established relationships is anticipated to provide pathways into helping support recovery through global outreach and medical education once the humanitarian crisis is resolved (11). Presently, the humanitarian aid detailed above continues alongside additional efforts to expand into two other facilities. An additional program is being developed to address urgent and prolonged field-care for combat medics.

CONCLUSIONS

Humanitarian aid may be durably and rewardingly provided using a remote approach that benefits from a structure reflecting mission-specific needs. In an ongoing crisis, plans should address personnel, mission expansion, supplies, and data management while ensuring OpSec. Safety permitting, education, and in-person aid may be appropriate for select members of a consulting team when skill transfer cannot be accomplished using telepresence. The ability to scale this approach to other facilities merits specific consideration. The blossoming of bidirectional relationships relies on durable commitments with constant teams. Relational dynamics are essential to embrace as they are foundational in supporting relief efforts and in providing bonds that forge pathways toward recovery.

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