Strategies to improve communication in telementoring in acute care coordination: a scoping review

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Background: Telementoring facilitates the coordination of advanced medical care in rural, remote or austere environments. Because the interpersonal element of telementoring has been relatively underexplored, we conducted a scoping review to identify strategies to improve communication in telementoring.

Methods: Two independent reviewers searched all English-language articles in MEDLINE and Scopus from 1964 to 2017, as well as reference lists of relevant articles to identify articles addressing telementored interactions between health care providers. Search results were gathered in June 2017 and updated in January 2018. Identified articles were categorized by theme.

Results: We identified 144 articles, of which 56 met our inclusion criteria. Forty-one articles focused on improving dispatcher-directed cardiopulmonary resuscitation (CPR). Major themes included the importance of language in identifying out-of-hospital cardiac arrest and how to provide instructions to enable administration of effective CPR. A standardized approach with scripted questions was associated with improved detection of out-of-hospital cardiac arrest, and a concise script was associated with improved CPR quality compared to no mentoring, unscripted mentoring or more complex instructions. Six articles focused on physician–physician consultation. Use of a handover tool that highlighted critical information outperformed an unstructured approach regarding transmission of vital information. Nine articles examined telementoring in trauma resuscitation. A common theme was the need to establish an understanding between mentor and provider regarding the limitations of the provider and his or her environment.

Conclusion: The available data suggest that standardization coupled with short, concise validated scripts could improve efficacy, safety and engagement. Improvements will require multidisciplinary input, practice and deliberate efforts to address barriers.

Contexte : Le mentorat en ligne facilite la coordination des soins médicaux de pointe dans les environnements ruraux, éloignés ou rudimentaires. Toutefois, le facteur relationnel de ce type d'interaction est resté plutôt sous-exploré. C'est pourquoi nous avons réalisé une revue exploratoire pour dégager des stratégies d'amélioration de la communication en contexte de mentorat en ligne.

Méthodes : Deux réviseurs indépendants ont cherché à recenser les articles portant sur les interactions de mentorat en ligne entre professionnels de la santé parmi tous les articles de langue anglaise publiés entre 1964 et 2017 indexés dans les bases de données MEDLINE et Scopus, ainsi que dans les listes bibliographiques des articles pertinents. Les résultats de recherche ont été recueillis en juin 2017 et actualisés en janvier 2018, et les articles recensés ont été regroupés par thèmes.

Résultats : Nous avons retenu 144 articles, dont 56 répondant à nos critères d'inclusion. De ce total, 41 portaient sur l'amélioration de la réanimation cardiorespiratoire (RCR) dirigée par un répartiteur. Parmi les thèmes principaux, on retrouve l'importance du langage dans l'identification des arrêts cardiaques hors de l'hôpital, ainsi que la manière de fournir des instructions permettant de pratiquer une RCR efficace. Une approche normalisée avec des questions scénarisées a été associée à une meilleure détection des arrêts cardiaques hors de l'hôpital, alors qu'un scénario concis a été associé à une amélioration de la qualité de la RCR comparativement à une approche sans mentorat, avec mentorat non scénarisé ou avec des instructions plus complexes. Six des articles retenus portaient sur la consultation de type médecin–médecin. Ils ont conclu que l'utilisation d'un outil de transfert mettant en évidence l'information importante était plus efficace qu'une approche

non structurée pour la transmission de renseignements vitaux. Finalement, 9 articles portaient sur le mentorat en ligne en réanimation traumatologique. Un des thèmes communs de ces articles était le besoin d'établir une compréhension mutuelle entre mentors et professionnels en ce qui concerne les restrictions de ces derniers et de leur environnement.

Conclusion : Les données disponibles semblent indiquer que la normalisation associée à des scénarios courts, concis et éprouvés pourrait améliorer l'efficacité, la sécurité et l'engagement. Cependant, toute amélioration nécessitera un encadrement multidisciplinaire, de la pratique et des efforts délibérés pour surmonter les obstacles.

Medical telementoring refers to remote guidance of a novice medical provider by an expert over distance.[1] Advances in information technology mean that telementoring is an increasingly attractive way to provide advanced medical care to rural, remote and austere environments.[2,3] Rather than discuss the use of telemedicine to facilitate the care of patients whose condition is stable by distant specialists, we focus on telementoring to improve acute care wherever major injury, illness or conflict occurs, and regardless of whether the responder has any medical training. Telementoring has been shown to augment ultrasonography assessment, trauma resuscitation and advanced surgical procedures, despite thousands of miles of separation between expert and provider.[4–12]

Research has heretofore focused on the technologic challenges of telementoring. Despite evidence that nontechnical and nontechnologic factors are among the greatest contributors to medical success or failure,[13] the interpersonal aspects — specifically, how humans communicate and react — have been comparatively understudied. There is also concern that remote resuscitation can be further hampered by emotional stress, physical barriers (access to the patient) and the loss of nonverbal communication (facial expressions, guiding the hands). Accordingly, we conducted a scoping review to identify strategies that could enhance communication and improve patient rescue over distance. Our objective was to complement the informatic and technical advances in telementoring.

Methods

Literature search

We conducted a literature search looking solely at telementored interaction between health care providers; this yielded very limited results. Therefore, the search was expanded, and we used a broad search strategy to capture all available literature that focused on situations in which an expert might be mentoring a relative novice through a medical interaction or procedure over distance. The search included the key terms "remote consultation," "telementoring," "mentoring," "video consultation," "dispatch-guided CPR" (cardiopulmonary resuscitation), "bystander CPR," "remote resuscitation" and "distance communication techniques." We searched all English-language articles in MEDLINE and Scopus from 1964 to 2017, as well as reference lists of relevant articles. Search results were gathered in June 2017 and updated in January 2018, with the use of Medical Subject Heading search terms where available, as well as free-text terms in different combinations.

Study selection

We included studies in the review if they involved telementored interactions between health care providers. This was further defined as any interaction between an experienced health care expert who gave advice and a health care provider who delivered care. We excluded retrieved articles if they were review studies, focused solely on telementoring technology or contained only provider–patient interactions (i.e., telemedicine rather than telementoring).

Two independent reviewers (L.A.H. and L.M.G.) identified relevant articles and categorized the reviews according to theme. A priori, any disagreement regarding inclusion and categorization was resolved by discussion between the reviewers. We graded the included studies using the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) approach,[14] with 4 levels of quality of evidence (Table 1).

Results

We retrieved 144 articles, of which 56 met our inclusion criteria and were included in the review. The search

Table 1. Grading of Recommendations, Assessment, Development and Evaluations (GRADE) approach to assessing the quality of evidence[14]*

Methodology	Quality rating
Randomized trials; double-upgraded observational studies	High
Downgraded randomized trials; upgraded observational studies	Moderate
Double-downgraded randomized trials; observational studies	Low
Triple-downgraded randomized trials; downgraded observational studies; case series or reports	Very low

*Factors that downgrade studies include risk of bias, limitations within study design, lack of precision and inconsistency of results. Factors that upgrade studies include large magnitude of effect or dose–response effect.

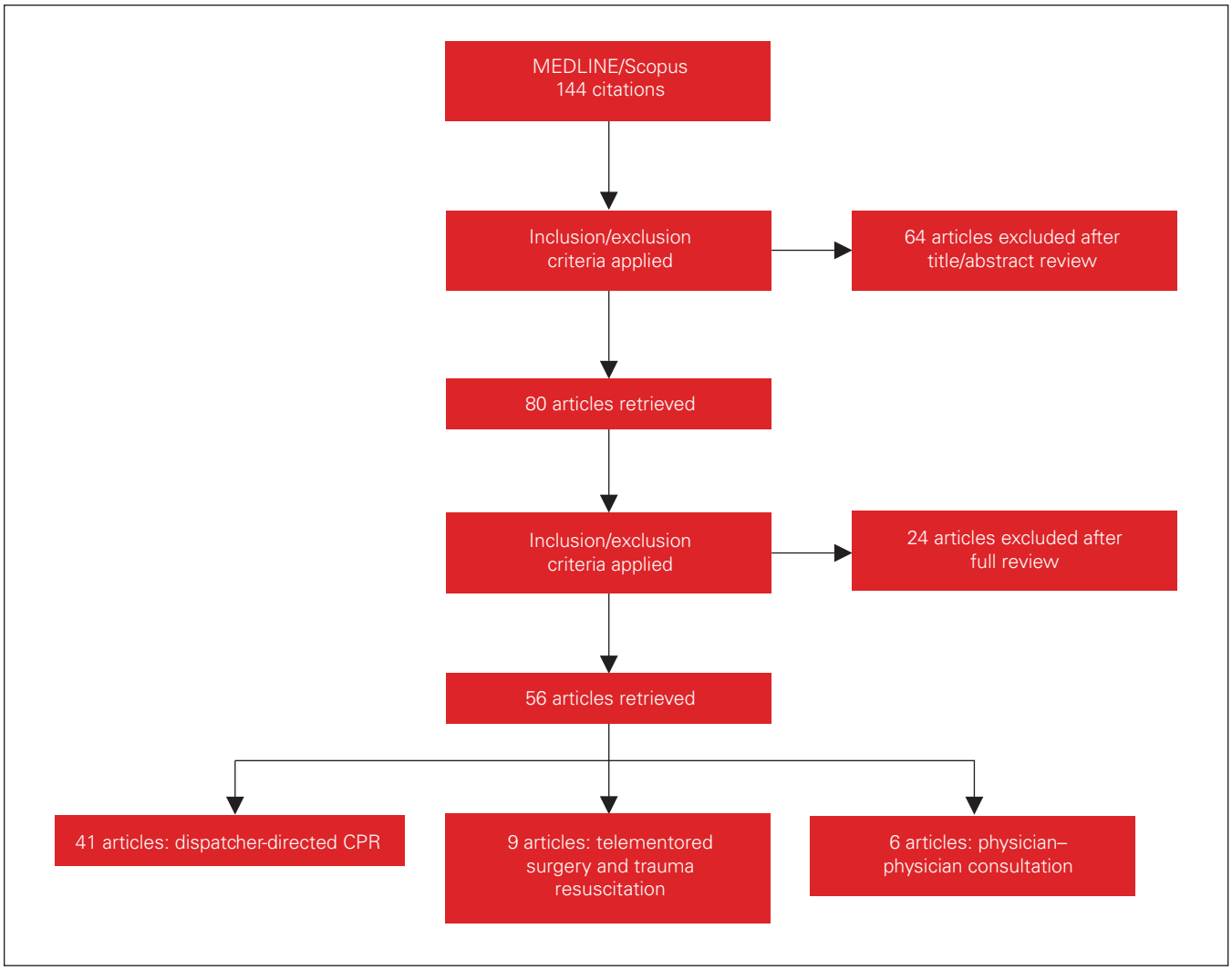

Fig. 1. Flow diagram showing article selection. CPR = cardiopulmonary resuscitation.

process is summarized in Figure 1, and the articles are summarized in Table 2. Of the 56 articles, 41 focused on improving dispatcher-directed CPR,[15–55] 6 focused on physician–physician consultation,[56–61] and 9 examined telementoring in trauma resuscitation.[8,10–12,62–66]

Dispatcher-directed cardiopulmonary resuscitation

The articles focusing on improving dispatcher-directed CPR[15–55] contained 2 main themes or recommendations: the importance of the dispatcher's identifying an out-of-hospital cardiac arrest, and providing clear instructions to the bystander to administer effective CPR and mitigate barriers. The former articles consisted primarily of retrospective and prospective observational studies. They included experienced dispatchers and used a structured triage tool with prompts to ask for critical information versus a free-form interview. When no structured triage tool was used, crucial questions were often omitted. This occurred up to 50% of the time[44] and despite the fact that all dispatchers claimed extensive experience. Articles with the theme of providing clear instructions to the bystander to administer effective CPR and mitigate barriers included randomized controlled trial (RCT) simulations, and prospective and retrospective observational studies, and evaluated the language used in dispatcher-directed CPR. Inclusion of telementoring consistently increased the proportion of bystanders who initiated CPR and improved rates of effective CPR. Simplified instructions improved CPR performance and decreased delays to initiation of CPR. Secondary assessments aimed to identify barriers to the initiation of CPR, including difficult patient access, language barriers and emotional distress.

Physician–physician consultation

The articles focusing on physician–physician consultation[56–61] included RCTs and observational studies on the use of a structured handover tool and the use of multimodal communication in the transfer of patient

Table 2 (part 1 of 2). Summary of included studies

Study	Method	Sample size	Outcome(s)	Relevant findings	GRADE rating
Improving dispatcher-directed cardiopulmonary resuscitation					
Bakke et al.,[15] 2017	Prospective observational	311	First aid measures attempted	Low precision in dispatcher advice	Low
Birkenes et al.,[16] 2013	Observational	72	Activation of speakerphone function	Standardized instructions	Low
Birkenes et al.,[17] 2014	RCT	30	Time to first compression, compression quality	Complex instructions resulted in delays Continuous instructions improved performance	Moderate
Birkenes et al.,[18] 2012	Observational	30	Compression technique	Continuous dispatcher assistance improved performance	Low
Brown et al.,[19] 2008	RCT	215	Time to first compression, total hands-off time	More complex instructions did not improve performance	High
Carter et al.,[20] 1984	Observational	203	CPR performance	Standardized instructions resulted in improved performance	Low
Cheung et al.,[21] 2007	Observational	51 lay	CPR quality metrics	More complex instructions did not improve performance	Low
Dami et al.,[22] 2010	Observational	264	Initiation of CPR	Barriers: not medically appropriate, physical limitations of caller, emotional distress	Low
Deakin et al.,[23] 2007	Observational	50	CPR quality metrics	More complex instructions did not improve performance	Low
Deakin et al.,[24] 2010	Observational	19	CPR initiated	Telementoring increased CPR initiation rates	Low
Dias et al.,[25] 2007	RCT	117	CPR quality metrics	Simplified protocol improved CPR performance	High
Ertl et al.,[26] 2007	Case–control	101	First aid measures	Multimedia communication improved performance	Very low
Fujie et al.,[27] 2014	Observational	559	Initiation of CPR	Lower rates of initiation by family members; higher rates with telementoring	Low
Fukushima et al.,[28] 2016	Observational	1850	Barriers to CPR	Emotional distress, patient access and positioning	Low
Ghuysen et al.,[29] 2011	RCT	110	CPR quality metrics	Standardized algorithm improved CPR initiation and quality	Moderate
Harve et al.,[30] 2007	RCT	54	CPR quality metrics	Additional instructions for automated external defibrillation did not compromise CPR quality	Moderate
Heward et al.,[31] 2004	RCT	100	Barriers to implementing DDCPR	Recognition of cardiac arrest, language problems, third-party caller	Low
Langlais et al.,[32] 2017	RCT	802	Barriers to CPR	Increased odds of overcoming barriers with multiple bystanders	Low
Martinage et al.,[33] 2013	Observational	38	Barriers to CPR	Persistence of emotional distress, physical incapacity	Low
Meron et al.,[34] 1996	Observational	114	Barriers to CPR	Emotional distress not a barrier to delivering CPR instructions	Low
Mirza et al.,[35] 2008	RCT	332	CPR quality metrics	Simplified instructions resulted in improved CPR performance	High
Navarro-Patón et al.,[36] 2017	Observational	38	CPR quality metrics	Constant telementoring improved CPR	Low
Nord-Ljungquist et al.,[37] 2015	Observational	20	CPR quality metrics	Standardized algorithm improved CPR initiation and quality	Low
O'Neill et al.,[38] 2007	Observational	145	CPR quality metrics	DDCPR improved rates of initiating CPR, but it was often delayed and of poor quality	Low
Rasmussen et al.,[39] 2017	RCT	128	CPR quality metrics	Scripted protocol with simple instructions, repetition, encouragement improved CPR	Moderate
Shimamoto et al.,[40] 2015	Prospective observational	19 669 OHCA calls	Initiation of CPR	DDCPR significantly increased rates of CPR initiation	Low
Stipulante et al.,[41] 2014	Observational	468	Initiation of CPR	DDCPR significantly increased rates of CPR initiation	Low
van Tulder et al.,[42] 2014	RCT	26	CPR quality metrics	No difference between 2 standardized scripts	Moderate
Van Vleet et al.,[43] 2012	RCT	519	CPR quality metrics	Oversimplification of instructions decreased CPR quality	Low
Recognizing out-of-hospital cardiac arrest					
Alfsen et al.,[44] 2015	Observational	21	Recognition of OHCA, thematic analysis	Recognition of OHCA depended on caller factors	Low
Bång et al.,[45] 2000	Observational	99	Interview time and quality	Important questions omitted in 30% of cases	Low

Table 2 (part 2 of 2). Summary of included studies

Study	Method	Sample size	Outcome(s)	Relevant findings	GRADE rating
Bång et al.,[46] 2003	Observational	100	Interview quality	Critical questions omitted in 26% of cases Protocol improved detection of OHCA	Low
Berdowski et al.,[47] 2009	Observational	258	Missed OHCA	OHCA not recognized in 29% of cases Critical questions omitted	Low
Bohm et al.,[48] 2007	Observational	76	Missed OHCA	Misinterpretation of agonal respirations by caller and dispatcher	Low
Clegg et al.,[49] 2014	Observational	47	Time to progress through OHCA protocol	Certain steps required more time and speaking turns	Low
Dami et al.,[50] 2010	Observational	294	Recognition of OHCA	Systematic-approach–initiated CPR in 69% of eligible cases	Low
Deakin et al.,[51] 2017	Cohort	2052	Sensitivity and PPV of National Health Service Pathways triage protocol	Protocol performed with 71.3% sensitivity, 4.2% PPV	Low
Fukushima et al.,[52] 2015	Cohort	905	Recognition of OHCA	Dispatch protocol modified to decrease ambiguity	Low
Hardeland et al.,[53] 2017	Observational	331	Recognition of OHCA	Targeted simulation, education and feedback significantly improved recognition of OHCA	Low
Riou et al.,[54] 2017	Observational	188	Caller response to verb tense used in triage protocol	Linguistic variations in scripted sentences of protocol affected efficiency of processing emergency calls	Low
Scott et al.,[55] 2012	Observational	268	Pulse detection rate	Expert, scripted instructions allowed detection of pulse rate by laypersons	Low
Physician–physician consultation					
Armstrong et al.,[56] 1997	Observational	120	Patient transfers	Telecommunication reduced transfers by 50%	Low
Cunningham et al.,[57] 2012	RCT	66	Telephone referral performance	SBAR communication tool improved call impact, time to first pitch and global rating scores	Moderate
Mair et al.,[58] 2011	Observational	33	No. of transfers	Videoconferencing decreased transfers compared to telephone consultation	Low
Marshall et al.,[59] 2009	RCT	168	Content and clarity of telephone call referral	ISBAR tool improved communication by junior clinicians	Moderate
Pimmer et al.,[60] 2013	RCT	42	Recall and transfer of information	Visual adjuncts did not contribute to recall and retention of verbally information	Moderate
Rogers et al.,[61] 2001	Observational	26	Transfers of patients with trauma	Teleconsultation enhanced trauma centre–community relations	Low
Telementored assessment and resuscitation					
Agarwal et al.,[62] 2016	Case series	80	Patient management	Protocolized care allowed teams to remotely diagnose, adjust and troubleshoot condition of critically ill patients	Very low
Dyer et al.,[12] 2008	Case series	20	Completion of FAST and EFAST examinations	Instructions given sequentially in simple, nontechnical language improved performance	Very low
Gerhardt et al.,[63] 2014	RCT	34	Completion of life-saving interventions	Telementoring improved accuracy and speed in completing critical actions	Moderate
Kirkpatrick et al.,[10] 2016	RCT	101	Accuracy of free fluid detection	Paralleled traditional mentoring with continuous audio and video communication	High
Lee et al.,[11] 2017	Randomized crossover	30	Rate of success in identifying appendix	Novice onsite practitioners able to perform ultrasonography as effectively as they could under onsite mentoring	Low
McBeth et al.,[8] 2013	Observational	19	Ultrasonographic images	Easy or very easy to follow experts' instructions	Low
Sibert et al.,[64] 2008	Case series	16	User satisfaction with interaction, transmission and image resolution	All mentors felt they could assist with intubation using video laryngoscopy; 89% would not be confident with audio alone	Very low
Stevanovic et al.,[65] 2017	Randomized open-label 2-arm parallel-group sequential noninferiority trial	Currently enrolling	System-induced adverse events	Study ongoing	High
Zeger et al.,[66] 2015	Observational	16	Time to intubation, success rate	Lower success rate with off-site mentoring Language barrier perceived to be a factor	Low

CPR = cardiopulmonary resuscitation; DDCPR = dispatcher-directed cardiopulmonary resuscitation; EFAST = extended focused assessment with sonography for trauma; FAST = focused assessment with sonography for trauma; GRADE = Grading of Recommendations, Assessment, Development, and Evaluations; ISBAR = Identify, Situation, Background, Assessment, Recommendation; OHCA = out-of-hospital cardiac arrest; PPV = positive predictive value; RCT = randomized controlled trial; SBAR = Situation, Background, Assessment, Recommendation.

information. A handover tool that highlighted critical information outperformed an unstructured approach in the delivery of pertinent information. A combination of audio and visual feedback improved the sense of team cohesion between services, and improved information recall and transfer efficiency.

Trauma resuscitation

The articles examining trauma resuscitation[8,10–12,62–66] included case series, RCTs and observational studies. Advanced surgical procedures, including laparoscopic surgery, were conducted successfully with the use of a common language between mentor and on-site mentee. Video conferencing and telestration technology were felt to improve communication on subjective evaluation by the participants. Telementoring in trauma resuscitation improved team performance in terms of faster initiation and completion of life-saving interventions.

Discussion

Our scoping review showed a concerning relative dearth of publications addressing the interpersonal challenges when relative strangers attempt to resuscitate over distance. To some, dispatcher-directed CPR may seem different, but it has many similarities with telementoring and teleresuscitation. Dispatcher-directed CPR currently accounts for the bulk of research in this area and therefore offers a useful starting point for future research. From the 56 articles identified, we conclude what may seem intuitive but has not been sufficiently emphasized: communication is a vital medical skill and should be deliberate, in terms of both what is said, and how it is understood and carried out.[13,67] Communication strategies that are standardized, short and concise, and use simple language appear to be better for both mentors and providers. Moreover, communication must not only relay facts but also identify resources and barriers if it is to maximize efficacy and safety. In short, communication should not be left to chance and cannot always be intuited. Just as pilots talk about "flying by voice," medical telementoring involves learning to "resuscitate by voice."[13,67] Overall, we believe that the potential of telementoring will be fully realized only when technology is matched by teamwork, and procedural dexterity is matched by "verbal dexterity."[67]

The ability of telemedicine to coordinate indirect resuscitation over distance is exciting and potentially life-saving. However, the available literature emphasizes that it is equivalent to interacting face-to-face or conducting a typical telephone call. During telementoring, the mentor needs to convey indirectly not only data but also information and meaning. This then needs to translate rapidly into direct physical action even though the provider is a relative novice or potentially scared, or both. Communication must also be sufficiently robust to make up for the lack of nonverbal communication (e.g., facial gestures and the ability to physically guide the hands of the resuscitator).[68] When all one has is words, those words take on special significance.

In a study on dispatcher-assisted CPR, Mirza and colleagues[35] found improvement in average chest compression depth when participants were instructed to "push as hard as you can" instead of "compress the chest 5 cm." In other words, with the use of a structured script rather than free-form communication, the provider delivered better chest compressions and for longer. The studies on dispatcher-directed CPR also emphasize that even the most experienced mentors can omit critical questions. This is concerning given that out-of-hospital cardiac arrest is easier to identify and simpler to address than, for example, complex multisystem trauma. Accordingly, the words chosen are likely even more important when directing more complex or far-forward interventions such as endotracheal intubation, chest tube insertion and damage-control surgery. Our review suggests that there could be value in preemptively scripting each of these procedures. Such scripts should be limited to critical steps, in the correct order, and unnecessary jargon should be avoided. Any script would require input from experts as well from those who are going to carry out the instructions. Scripts would be "fit for task" only once validated by end-users and maintained through realistic ongoing simulations.

Instructions might also need to be modified for language and educational level. For example, children have performed well with remotely mentored ultrasonography using simple "up," "down," "right" and "left" commands.[69] In contrast, they were baffled by terms such as "parallel" and "rotate." In terms of vocabulary, in the United Kingdom, you are likely to be understood if you say "there's a bloke in the A and E, struck by a lorry on the M5 roundabout," but such language is far less likely to work in North America, even if the details are the same. Those who work in dispatch already have experience giving instructions to a wide variety or recipients and would therefore be key contributors to modifications.

Interestingly, emotional distress was not found to be a major barrier to CPR initiation in our review. Similarly, in a study of simulated remote damage-control surgery by nonphysicians, participants had lower stress (as measured by a post-test survey and heart rate variability) than when they performed the same procedure without guidance.[6,70] The most common barriers to CPR initiation were physical limitations, namely, if the provider was unfit to provide aid or the patient was not easily accessed. Extreme environments may hamper access, and remote providers may also have personal connections to the patient. It is therefore important that the mentor understand "what it's like out there" and what state of mind the provider is in in order to provide useful and usable advice.[70] Taking a few

moments at the onset of a telementored resuscitation to obtain an understanding of the physical environment, the available resources (both physical and human), the level of training and capabilities of the mentee, and perceived barriers may increase the chance of patient rescue and provider engagement.

Limitations

Limitations of our review include the paucity of literature in the area of telementoring, the heterogeneity of outcomes and the inherent difficulty with evaluating communication. This prevented a true meta-analysis. The bulk of body of evidence also comes from dispatcher-directed CPR, and, although useful extrapolations can be made, CPR is simpler and more predictable than other tasks.

Conclusion

As medicine and technology improve, research into the nontechnical factors of telementoring must keep pace. Communication strategies consisting of standard approaches, short, concise validated scripts using simple language, and systematic identification of available resources and barriers to success have the potential to improve the safety, efficacy and overall experience for mentors and remote providers, and require further study.

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