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 cardio-respiratoire (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
Medical telementoring refers to remote guidance of a novice medical provider by an expert over distance. Advances in information technology mean that telementoring is an increasingly attractive way to provide advanced medical care to rural, remote and austere environments. 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.

Research has heretofore focused on the technologic challenges of telementoring. Despite evidence that non-technical and nontechnologic factors are among the greatest contributors to medical success or failure, 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, 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
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, 6 focused on physician–physician consultation, and 9 examined telementoring in trauma resuscitation.

Dispatcher-directed cardiopulmonary resuscitation

The articles focusing on improving dispatcher-directed CPR 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 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 included RCTs and observational studies on the use of a structured handover tool and the use of multimodal communication in the transfer of patient information to the receiving physician.
Table 2 (part 1 of 2). Summary of included studies

| Study | Method | Sample size | Outcome(s) | Relevant findings | GRADE rating |
|-------|--------|-------------|------------|-------------------|--------------|
| Bakke et al., 2017 | Prospective observational | 311 | First aid measures attempted | Low precision in dispatcher advice | Low |
| Birkenes et al., 2013 | Observational | 72 | Activation of speakerphone function | Standardized instructions | Low |
| Birkenes et al., 2014 | RCT | 30 | Time to first compression, compression quality | Complex instructions resulted in delays | Moderate |
| Birkenes et al., 2012 | Observational | 30 | Compression technique | Continuous dispatcher assistance improved performance | Low |
| Brown et al., 2008 | RCT | 215 | Time to first compression, total hands-off time | More complex instructions did not improve performance | High |
| Carter et al., 1984 | Observational | 203 | CPR performance | Standardized instructions resulted in improved performance | Low |
| Cheung et al., 2007 | Observational | 51 lay | CPR quality metrics | More complex instructions did not improve performance | Low |
| Dami et al., 2010 | Observational | 264 | Initiation of CPR | Barriers: not medically appropriate, physical limitations of caller, emotional distress | Low |
| Deakin et al., 2007 | Observational | 50 | CPR quality metrics | More complex instructions did not improve performance | Low |
| Deakin et al., 2010 | Observational | 19 | CPR initiated | Telementoring increased CPR initiation rates | Low |
| Dias et al., 2007 | RCT | 117 | CPR quality metrics | Simplified protocol improved CPR performance | High |
| Erli et al., 2007 | Case-control | 101 | First aid measures | Multimedia communication improved performance | Very low |
| Fuje et al., 2014 | Observational | 559 | Initiation of CPR | Lower rates of initiation by family members; higher rates with telementing | Low |
| Fukushima et al., 2016 | Observational | 1850 | Barriers to CPR | Emotional distress, patient access and positioning | Low |
| Ghuysen et al., 2011 | RCT | 110 | CPR quality metrics | Standardized algorithm improved CPR initiation and quality | Moderate |
| Harve et al., 2007 | RCT | 54 | CPR quality metrics | Additional instructions for automated external defibrillation did not compromise CPR quality | Moderate |
| Heward et al., 2004 | RCT | 100 | Barriers to implementing DDCPR | Recognition of cardiac arrest, language problems, third-party caller | Low |
| Langlais et al., 2017 | Observational | 802 | Barriers to CPR | Increased odds of overcoming barriers with multiple bystanders | Low |
| Martineau et al., 2013 | Observational | 38 | Barriers to CPR | Persistence of emotional distress, physical incapacity | Low |
| Meron et al., 1996 | Observational | 114 | Barriers to CPR | Emotional distress not a barrier to delivering CPR instructions | Low |
| Mirza et al., 2008 | RCT | 332 | CPR quality metrics | Simplified instructions resulted in improved CPR performance | High |
| Navarro-Patón et al., 2017 | Observational | 38 | CPR quality metrics | Constant telementoring improved CPR | Low |
| Nord-Ljungquist et al., 2015 | Observational | 20 | CPR quality metrics | Standardized algorithm improved CPR initiation and quality | Low |
| O’Neill et al., 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., 2017 | RCT | 128 | CPR quality metrics | Scripted protocol with simple instructions, repetition, encouragement improved CPR | Moderate |
| Shimamoto et al., 2015 | Prospective observational | 19 669 OHCA calls | Initiation of CPR | DDCPR significantly increased rates of CPR initiation | Low |
| Stipulante et al., 2014 | Observational | 468 | Initiation of CPR | DDCPR significantly increased rates of CPR initiation | Low |
| van Tulder et al., 2014 | RCT | 26 | CPR quality metrics | No difference between 2 standardized scripts | Moderate |
| Van Vleet et al., 2012 | RCT | 519 | CPR quality metrics | Oversimplification of instructions decreased CPR quality | Low |

Recognizing out-of-hospital cardiac arrest

| Alfsen et al., 2015 | Observational | 21 | Recognition of OHCA, thematic analysis | Recognition of OHCA depended on caller factors | Low |
| Bang et al., 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., 2003 | Observational | 100 | Interview quality | Critical questions omitted in 26% of cases; Protocol improved detection of OHCA | Low |
| Berdowski et al., 2009 | Observational | 258 | Missed OHCA | OHCA not recognized in 29% of cases; Critical questions omitted | Low |
| Bohn et al., 2007 | Observational | 76 | Missed OHCA | Misinterpretation of agonal respirations by caller and dispatcher | Low |
| Clegg et al., 2014 | Observational | 47 | Time to progress through OHCA protocol | Certain steps required more time and speaking turns | Low |
| Dami et al., 2010 | Observational | 294 | Recognition of OHCA | Systematic-approach–initiated CPR in 89% of eligible cases | Low |
| Deakin et al., 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., 2015 | Cohort | 905 | Recognition of OHCA | Dispatch protocol modified to decrease ambiguity | Low |
| Hardeland et al., 2017 | Observational | 331 | Recognition of OHCA | Targeted simulation, education and feedback significantly improved recognition of OHCA | Low |
| Riou et al., 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., 2012 | Observational | 268 | Pulse detection rate | Expert, scripted instructions allowed detection of pulse rate by laypersons | Low |
| Armstrong et al., 1997 | Observational | 120 | Patient transfers | Telecommunication reduced transfers by 50% | Low |
| Cunningham et al., 2012 | RCT | 66 | Telephone referral performance | SBAR communication tool improved call impact, time to first pitch and global rating scores | Moderate |
| Mair et al., 2011 | Observational | 33 | No. of transfers | Videoconferencing decreased transfers compared to telephone consultation | Low |
| Marshall et al., 2009 | RCT | 168 | Content and clarity of telephone call referral | ISBAR tool improved communication by junior clinicians | Moderate |
| Pimmer et al., 2013 | RCT | 42 | Recall and transfer of information | Visual adjuncts did not contribute to recall and retention of verbally information | Moderate |
| Rogers et al., 2001 | Observational | 26 | Transfers of patients with trauma | Teleconsultation enhanced trauma centre–community relations | Low |
| Agarwal et al., 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., 2008 | Case series | 20 | Completion of FAST and EFAST examinations | Instructions given sequentially in simple, nontechnical language improved performance | Very low |
| Gerhardt et al., 2014 | RCT | 34 | Completion of life-saving interventions | Telementoring improved accuracy and speed in completing critical actions | Moderate |
| Kirkpatrick et al., 2016 | RCT | 101 | Accuracy of free fluid detection | Paralleled traditional mentoring with continuous audio and video communication | High |
| Lee et al., 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., 2013 | Observational | 19 | Ultrasonographic images | Easy or very easy to follow experts’ instructions | Low |
| Sibert et al., 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., 2017 | Randomized open-label 2-arm parallel-group sequential noninferiority trial | Currently enrolling | System-induced adverse events | Study ongoing | High |
| Zeger et al., 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 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. 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.” 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.”

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). When all one has is words, those words take on special significance.

In a study on dispatcher-assisted CPR, Mirza and colleagues 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. 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. 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. 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 non-technical 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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