



**Health  
Information  
and Quality  
Authority**

An tÚdarás Um Fhaisnéis  
agus Cáilíocht Sláinte

# **Review of guidance for the operation of emergency medical dispatch centres in the context of COVID-19 and beyond**

**4 September 2020**

The Health Information and Quality Authority (HIQA) has developed a series of guidance reviews to assist the National Public Health Emergency Team (NPHE) in their response to COVID-19. This review of guidance was developed to assist the National Ambulance Service in particular, by addressing the following research question:

**What guidance is available for the operation of emergency medical dispatch centres in the context of COVID-19 and beyond?**

The processes as outlined in HIQA's Draft Protocol: *'Identification of guidance for pre-hospital emergency services and patient transport services in the context of COVID-19 and beyond'* were followed. Below is a summary of relevant guidance identified up to and including 21 July 2020.

## Key points

- Emergency medical dispatch centres are central to prehospital emergency care, and represent a valuable source of information on patterns of calls requesting medical information or assistance. As such, these services remain a vital component of the ongoing COVID-19 response.
- This review identified 52 documents relevant to the operation of emergency medical dispatch centres in the context of COVID-19 and beyond. These included 27 documents classified for the purposes of this review as 'guidance' and 26 classified as 'practice', including one document which was classified into both categories.
- Among documents classified as 'guidance', the majority (22 of 27) were from sources with clear authority to provide guidance. Among these, 13 were from US government institutions or US organisations involved in representing or providing emergency services.
- Guidance documents were largely high-level in nature, providing lists of recommendations as opposed to in-depth descriptions of approaches, and for the most part cited existing guidance to support the document content or did not refer to any evidence base. Limited detail was provided in the documents regarding the guidance development process.
- Documents classified as 'practice' included reports of survey results and of experiences or approaches to providing emergency services during the pandemic. These included four documents from the SARS setting in addition to COVID-19 related documents.
- Guidance and practice were grouped under 12 subtopics within three main themes: 'COVID-19 pathways for response', 'Workforce and workplace' and 'Governance and planning'.
- The 'COVID-19 pathways for response' theme included 6 subtopics: 'public messaging', 'call screening and person under investigation (PUI) communication', 'arrangements for receiving calls', 'triage and prioritisation of calls', 'streamlining dispatch response', and 'telemedicine'.

- Across all subtopics, the largest quantity of guidance and practice was found for the topics of 'call screening and person under investigation (PUI) communication' and 'arrangements for receiving calls'. These included examples of implementation of screening questionnaires and approaches to the redirection of calls in various countries, among other initiatives.
- The 'workforce and workplace' theme included the subtopics 'workforce capacity', 'workforce health and well-being' and 'physical distancing or remote working'. These subtopics considered alternative staffing models and included points for consideration in protecting staff from infection and reducing stress.
- The 'governance and planning' theme included the subtopics 'resilience', 'monitoring (COVID-19 or operations)' and 'information governance, protocols and procedures'. The importance of developing backup sites and strengthening infrastructure, including cybersecurity, were highlighted, as well as the importance of updating protocols and procedures to cater for the COVID-19 setting.
- Little guidance was provided for medium-term or long-term planning concerns related to the evolving COVID-19 pandemic, though the importance of monitoring of both incoming data and service provision was frequently highlighted.
- Given the evolving nature of the COVID-19 pandemic, guidance may be subject to change and may not be transferable across jurisdictions and or at different time points.

## **Background**

In June 2020, the Health Information and Quality Authority (HIQA) performed a review on behalf of the National Ambulance Service to aid their response during the COVID-19 epidemic. This [review](#) identified and categorised guidance available for pre-hospital emergency services and patient transport services in the context of COVID-19 and beyond. Following this initial general review, a subsequent request was made by the National Ambulance Service for an in-depth review on the topic of 'guidance for the operation of emergency medical dispatch centres'. The aim of the present review is to identify, classify and summarise international guidance on this particular topic in order to inform the development of guidance by the National Ambulance Service.

The focus of this review is on guidance published by national-level health and emergency services authorities and professional associations, and lessons learned from the operation of emergency medical dispatch centres, in the midst of COVID-19 or other recent respiratory virus epidemics or pandemics.

## **Methods**

For the initial review, a protocol outlining the methodology was developed by HIQA: [\*'Protocol: Identification of guidance for pre-hospital emergency services and patient transport services in the context of COVID-19 and beyond'\*](#). For the present review, an appendix was added to outline the steps taken for this particular topic.

In order to identify relevant documents, the present review largely drew from the body of literature collated for the initial review, as [published in database format](#), though additional searches were completed to identify any newly published relevant documents. New aspects of the present review included the approaches to quality assessment and to qualitative analysis for the included documents, as described within the protocol appendix.

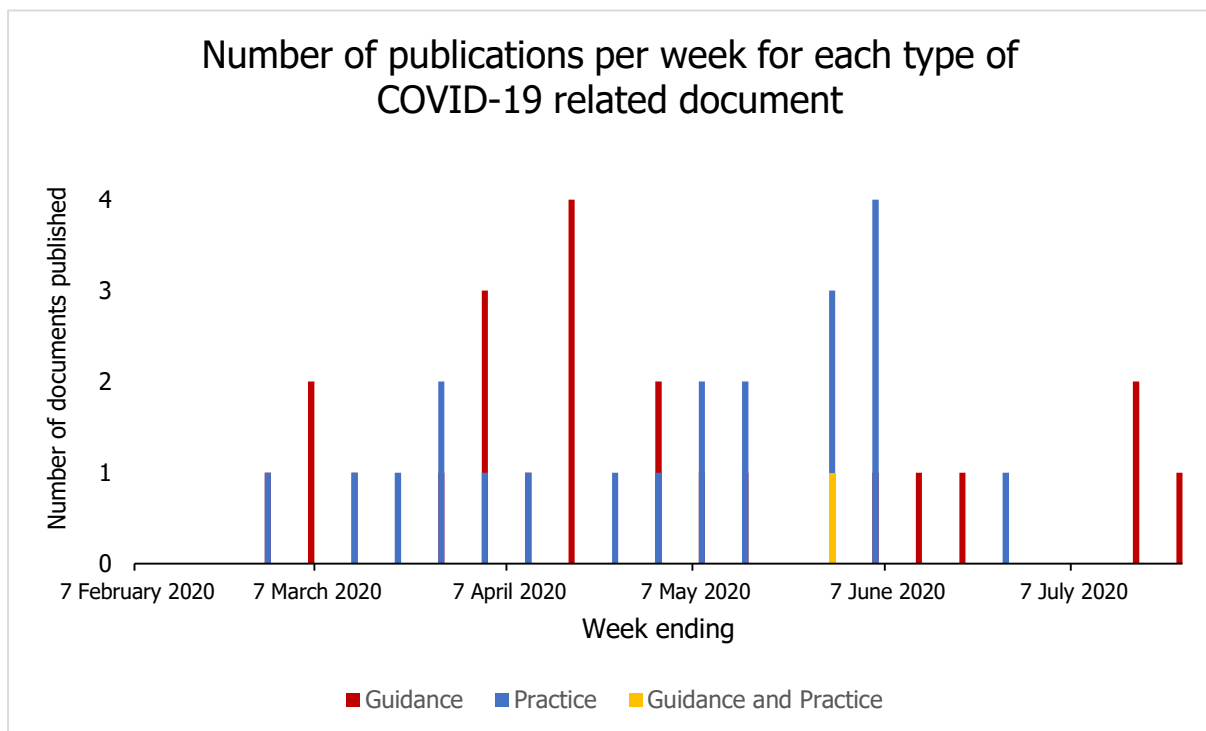
For the purposes of this review, documents were divided into two major groups; 'guidance' and 'practice'. Documents were classified as 'guidance' when they mostly included prospective recommendations, instructions or considerations for the operation of a service, even if a document did not specifically claim to present 'guidance'. Documents were classified as 'practice' when they mostly contained a retrospective view of how the service operated, such as a report of a survey of organisations involved in providing services or a description of 'lessons learned' from past experience.

## Results

A total of 52 documents were identified for this review, 48 of which related to COVID-19 (SARS-CoV-2) and four of which related to the SARS setting (SARS-CoV).<sup>(1-4)</sup> Publication dates, where reported, ranged from 22 February 2020 to 21 July 2020 for COVID-19 related documents (see Figure 1) and from April 2004 to September 2006 for SARS-related documents. The documents identified were published in the following settings: USA (n=22), Italy (n=6), Canada (n=3), China (n=2), Israel (n=2), Switzerland (n=2), one each in Austria, Denmark, France, Egypt, England, India, Ireland, Singapore, Taiwan, and six that were not specific to any country.

Among the 52 documents, 27 were classified as 'guidance', while 26 were classified as 'practice', including one document which could be classed as either guidance or practice. All of the 'guidance' documents considered the COVID-19 setting, while the 'practice' documents included the four documents which considered the SARS (SARS-CoV) setting.<sup>(1-4)</sup>

**Figure 1: Number of publications per week for documents in the COVID-19 setting where publication dates were known (N=45)**



## **Guidance documents identified**

### **Quality assessment of guidance**

For the 27 documents identified as 'guidance' a quality assessment was performed, the results of which are tabulated in Appendix 1, Table App 1.1 and described below.

#### *Type of guidance*

The term 'guidance' was explicitly used by few of the documents. Only eight documents were observed to specifically use the term 'guidance' or 'guidelines' to describe their content,<sup>(5-12)</sup> including one document which reported on the development of a piece of guidance.<sup>(12)</sup> The remainder included checklist documents,<sup>(13-16)</sup> or stated that the content comprised 'recommendations',<sup>(6, 7, 17-21)</sup> 'information',<sup>(22, 23)</sup> 'considerations',<sup>(24, 25)</sup> an 'advisory',<sup>(26)</sup> a 'framework',<sup>(27)</sup> 'requirements',<sup>(28)</sup> a 'standard operating procedure'<sup>(29)</sup> or a 'statement paper'.<sup>(30)</sup> One document, while presenting 'strategies' and 'best practices for consideration' specifically stated that the content does not constitute and should not be considered as guidance.<sup>(31)</sup>

#### *Source: authoritative versus non-authoritative*

Among the 27 documents classified for this review as 'guidance' (including one document classified as 'both guidance and practice'), the vast majority (N=22) were from sources with clear authority to provide guidance (see Table App 1.1). For the purposes of this review, authority was defined as that associated with national-level organisations involved in overseeing or providing pre-hospital emergency services. The remaining five documents were classified as non-authoritative, that is, they were published by individual authors or groups of authors with expertise in the field, but not representing authoritative organisations charged with overseeing or providing pre-hospital emergency services.<sup>(10, 12, 20, 21, 30)</sup>

Among the 22 authoritative documents, the country most frequently represented was the USA, with 13 documents identified from various organisations. Two further documents were from the Pan-American Health Organisation.<sup>(6, 13)</sup> The remaining seven documents were from NHS England,<sup>(27)</sup> the Pre-Hospital Emergency Care Council of Ireland,<sup>(26)</sup> the Indian Ministry of Health,<sup>(29)</sup> the Chinese National Health Commission,<sup>(28)</sup> the European Society for Emergency Medicine,<sup>(19)</sup> the Collaborative Coalition for International Public Safety,<sup>(18)</sup> and the International Liaison Committee on Resuscitation.<sup>(11)</sup>

*Guidance content: relevance*

Seven documents were judged to provide 'thorough' guidance on the topic of emergency medical dispatch centre operations<sup>(5, 6, 13, 17, 18, 22, 31)</sup> and six documents had this topic as the primary focus of the document.<sup>(5, 14, 17, 18, 22, 31)</sup> Five documents met both of these criteria.<sup>(5, 17, 18, 22, 31)</sup>

Documents were judged as providing 'thorough' guidance when they provided guidance on a wide range of aspects relating to emergency medical dispatch centre operations. However, such documents rarely provided in-depth guidance<sup>(5, 6)</sup> and several comprised checklists<sup>(13)</sup> or brief lists of points.<sup>(17, 18, 22, 31)</sup>

*Guidance content: evidence basis and guidance development*

Only one of the 27 documents appeared to cite evidence supporting efficacy or effectiveness of an intervention.<sup>(20)</sup> This article, written by a paramedic and a traumatologist from a non-profit air ambulance and ground transportation service in Ontario, Canada, concerned the management of stress among emergency medical services (EMS) employees during COVID-19. The article discussed peer support and stress management approaches, citing a number of relevant articles. However, the article was classified for this review as non-authoritative and was published as an educational feature in the website 'emsworld.com'.

Twelve additional documents were observed to cite existing guidance as the basis for the document content.<sup>(5-8, 10-13, 21, 24, 26, 31)</sup> Nine of these were considered to be 'authoritative'.<sup>(5-8, 11, 13, 24, 26, 31)</sup> Ten of the 12 documents were from the US or were published by the Pan-American Health Organization,<sup>(6, 13)</sup> and all of the US documents cited guidance from the US Centers for Disease Control and Prevention (CDC).<sup>(5, 7, 8, 10, 12, 21, 24, 31)</sup> One document was an advisory document from the Irish Pre-hospital Emergency Care Council, which referred to existing Irish guidance, including from the Health Protection Surveillance Centre and the Health Service Executive. Another, from the International Liaison Committee on Resuscitation (ILCOR),<sup>(11)</sup> referred to their existing guidance and a systematic review conducted by them organisation in March 2020.

Notably, the Pan-American Health Organization checklist of 'Prehospital Emergency Medical System Readiness' included a bibliography of 12 other guidance documents which informed the document.<sup>(13)</sup> Similarly, the CDC guidance document<sup>(7)</sup> cited a number of existing CDC guidance documents and also the 'EMS Infectious Disease Playbook', another US government guidance document.



Few of the documents referred to the process by which the guidance was developed. The Pan American Health Organization checklist<sup>(13)</sup> was stated to have been developed based on past pandemic experiences, while the set of guidelines by Global Medical Response Inc. were stated to be based on CDC guidance, available scientific evidence, operational best practices, and expert consensus.<sup>(8)</sup> ILCOR described a process of reviewing existing guidance in light of findings of their recent systematic review,<sup>(11)</sup> Hart et al. stated that their recommendations were established through a review of the current literature,<sup>(21)</sup> and Osborn et al. described the development of guidance process, highlighting a literature review and formation of a guidance development stakeholder working group.<sup>(12)</sup> However, these three examples of guidance contained little content specific to this review.

### **Practice documents identified**

The 26 documents classified as 'practice' included descriptive reports of experiences, interventions applied, lessons learned or potential best practices from other relevant pandemic settings.

Nine of the documents were from sources with clear authority to provide guidance.<sup>(32-40)</sup> These included reports of experience from national pre-hospital emergency service providers in Austria,<sup>(33)</sup> Egypt,<sup>(40)</sup> Israel<sup>(41)</sup> and Italy,<sup>(35)</sup> a report from the European Emergency Number Association on data and strategies adopted in various European countries,<sup>(34)</sup> and four documents from the US; the latter included two survey reports produced by the National Emergency Number Association,<sup>(37, 38)</sup> a survey from the National Association of Emergency Medical Technicians,<sup>(39)</sup> and a report from FEMA on examples of successful practices observed in EMS across the US.<sup>(36)</sup>

The remaining 16 documents classified as 'practice', but considered to be non-authoritative, were published as academic manuscripts and were from a range of settings including Denmark,<sup>(42)</sup> France,<sup>(43)</sup> Italy,<sup>(44-48)</sup> Israel,<sup>(49)</sup> Switzerland,<sup>(50, 51)</sup> the United States,<sup>(12, 52)</sup> Canada,<sup>(3, 4)</sup> China,<sup>(53)</sup> Singapore<sup>(2)</sup> and Taiwan.<sup>(1)</sup> The reports from Canada, Singapore and Taiwan all pertained to the SARS (SARS-CoV) setting<sup>(1-4)</sup> as opposed to the COVID-19 setting. Four of the COVID-19 related documents were published as preprint articles and therefore have not been subject to formal peer review.<sup>(42, 43, 45, 52)</sup>

Among these non-authoritative 'practice' documents, several were primarily focused on approaches towards the transport of patients<sup>(1, 2, 12, 45)</sup> or examined topics such as patient treatment or occupational exposure to infection when treating patients,<sup>(44, 51, 52)</sup> as opposed to primarily focusing on the operation of dispatch centres. However,

others predominantly described approaches to handling increased call centre demand and improving dispatch efficiency.<sup>(42, 46, 47, 50, 53)</sup>

## **Content of guidance and practice documents; analysis by theme and subtopic**

The framework synthesis approach adopted for this analysis resulted in a final thematic framework comprising three overarching themes (highlighted in bold) and 12 subtopics in total. For each of the 12 subtopics, a narrative summary is presented below for each of 'guidance' and 'practice'. These summaries are accompanied by detailed presentation of the data in tabular form in Appendix 2.

### **Final thematic framework**

- **COVID-19 pathways for response**
  1. public messaging
  2. call screening and person under investigation communication
  3. arrangements for receiving calls (e.g. auto-answer, specific hotline, redirect call, dedicated call centre)
  4. triage and prioritisation of calls (including the use of algorithms)
  5. streamlining dispatch response (e.g. recommend self or no transport, assign less than usual response, diversion to alternate site, altered vehicle dispatch approach)
  6. telemedicine.
- **Workforce and workplace**
  7. workforce capacity
  8. workforce health and well-being
  9. physical distancing or remote working.
- **Governance and organisational planning**
  10. resilience
  11. monitoring (COVID-19 or operations)
  12. information governance, protocols and procedures.

### **'COVID-19 pathways for response' subtopics**

#### ***1. Public messaging***

A total of eight documents were identified as relevant to this subtopic, including six classified as guidance and two classified as practice (see Appendix 2, Table App 2.1).

#### *Guidance summary*

When setting up alternative call lines such as hotlines, a free-of-charge dedicated information number should be considered for general questions about COVID-19. These dedicated numbers should be short (3-5 digits), easy to remember and properly advertised. Public messaging should be used to emphasise the correct number to call and pre-recorded messages and interactive voice responses used to remind callers about numbers to call.

Media messages, including social media, should be created to assist the public in accessing assistance and information. Multi-channel communication with the public should be simple, clear and coherent to avoid misinformation. If technology enables it, localised messages, in addition to nation-wide alerts should be considered. Providing information in different languages should also be considered. To avoid misinformation and reduce the impact of disinformation, all information should be factual and reliable, reaching as much of the population as possible.

### *Practice summary*

The emergency medical services in Copenhagen, Denmark present an example of public messaging following the implementation of alternative call handling arrangements. The service implemented a separate coronavirus hotline followed by a web-based self-triage system (WBSTS) to reduce non-emergency call volume and made use of press releases and the websites and social media channels of hospitals to publicise the new services.<sup>(42)</sup>

## ***2. Call screening and person under investigation (PUI) communication***

A total of 20 relevant documents were identified for this subtopic, including 13 classified as guidance and seven classified as practice (see Appendix 2, Table App 2.2).

### *Guidance summary*

Caller COVID-19 screening, that is, assessment of callers over the phone to identify whether a patient may have COVID-19, is one strategy that could be used to manage limited EMS resources. However, the screening process should never supersede the provision of pre-arrival instructions to the caller when immediate lifesaving interventions (e.g., CPR or the Heimlich manoeuvre) are indicated. The call protocol should be updated as the public health response proceeds and should include an up-to-date screening questionnaire that includes COVID-19 symptoms and risk factors (e.g., history of travel to affected areas), based on current case definition. Patients who meet the appropriate criteria should be evaluated and transported as a person under investigation (PUI). Where the PUI is experiencing

COVID-19 signs and symptoms, this needs to be communicated to pre-hospital first responders and to the receiving hospital.

### *Practice Summary*

Screening of callers to determine the potential risk of COVID-19 exposure prior to dispatch is being conducted in many cases by emergency dispatchers. FEMA note that in Michigan, USA, when the COVID-19 status of an area or residence is unknown, 911 dispatchers ask callers questions to determine the potential risk of COVID-19 exposure prior to dispatch.<sup>(36)</sup> In Italy, a COVID-19 Response Team of ten healthcare professionals supported by two technicians was established with the ultimate goal of tackling the viral outbreak without burdening ordinary EMS services.<sup>(48)</sup> The team assessed the clinical condition of screened individuals to determine the need for hospital admission or for home testing for SARS-CoV-2 and subsequent isolation. In the Emilia Romagna region of Italy, dispatch centres had dedicated Public Health Physicians (PHPs), who were able to interact with patients and call takers regarding SARS-CoV-2 infection.<sup>(47)</sup> During the SARS-CoV pandemic, after the report of the first probable SARS case in Taipei, EMS dispatchers screened all EMS calls with a unified protocol to acquire information on the occurrence of fever, quarantine status, and any diagnosis of SARS to ensure SARS cases or patients of high risk could be transported appropriately.<sup>(1)</sup>

Regarding communication with other healthcare workers or hospitals regarding PUI, The United States' Federal Emergency Management Agency (FEMA) note that in the State of Kansas, the Department of Health and Environment's guidelines emphasise that close coordination and consistent communication between all components of the health system are needed to ensure all parties are notified in advance that they may be caring for a patient with COVID-19.<sup>(36)</sup> In King County, Washington, Seattle, the high-risk criteria for patient transport was updated to include the first long-term care facility where initial cases were identified, with dispatch to alert "PPE advised" for any response to the address.<sup>(52)</sup> During the SARS pandemic in Singapore, when there were uncertainties about the history, especially of a possible SARS contact, or to which hospital the patient should be brought, paramedics could clarify with the personnel at the control centre in the Singapore Civil Defence Force or the emergency physician at the receiving hospital.<sup>(2)</sup> Checks were also made with the SARS hotline set up by the Ministry of Health through the control room, which had access to patients who were on home quarantine orders.<sup>(2)</sup>

### ***3. Arrangements for receiving calls (e.g. auto-answer, specific hotline, redirect call, dedicated call centre)***

A total of 25 relevant documents were identified for this subtopic, including, 13 classified as guidance and 12 classified as practice (see Appendix 2, Table App 2.3).

#### *Guidance summary*

EMS should prepare to initiate auto-answer/recorded answering of emergency calls and referral or redirection of non-emergency calls or calls for information to another call centre, to websites, links, or to non-emergency lines. Consideration should be given to involving other disciplines to filter some or all calls related to COVID-19. A technological platform should be available for the correct classification of alerts, call management, and information management.

Consideration should be given and preparation should be made for the impact that the outbreak and measures such as lockdowns may have on other services, such as hotlines for domestic violence, children, mental health and suicide.

#### *Practice Summary*

Dedicated hotlines and online services have been established in many European countries.<sup>(33, 34, 42, 47, 50)</sup>

Mowafi et al. report that a survey of the WHO's Eastern Mediterranean Region (EMR) ministry of health websites, personal communications with ministry of health staff, and reviews of public news reports revealed that 20 of 22 EMR member-states (and Palestine) have established ad hoc national or regional COVID-19 hotlines for the public to access information, report suspected cases, and be screened for symptoms of COVID-19.<sup>(40)</sup> Early reports indicate widespread utilisation of these hotlines. An overwhelming public demand for COVID-19 information in the United Arab Emirates led to the creation of a WhatsApp account powered by artificial intelligence to answer the large number of public inquiries.<sup>(40)</sup>

Four EMS services in Paris increased their capacity to cope with the surge of calls during the COVID-19 crisis by creating specific procedures for COVID-19-related calls.<sup>(43)</sup> These procedures included dedicated computer stations, interactive voice server, video consultation, and sending instructions by SMS.

In March 2003, a Provincial Transfer Authorization Centre (PTAC) was set up in Toronto, Canada to coordinate, control, and track all inter-facility patient transfers in Ontario as well as to lower the risk of spreading of SARS among facilities, workers

and patients.<sup>(3)</sup> The PTAC was co-located with the Toronto EMS Central Ambulance Communications Centre (CACC) at Toronto EMS headquarters centre. Managers reassigned paramedic supervisors, dispatchers, and support staff to operate the centre. Staff began collating incoming transfer requests, answering telephones, and processing requests based on a decision algorithm designed to determine which transfers could be approved. The authors of the report on this centre concluded that the PTAC was successful because it was built on existing systems, while being flexible to meet the changing needs during the SARS outbreak.<sup>(3)</sup>

#### ***4. Triage and prioritisation of calls (including the use of algorithms)***

A total of 13 relevant documents were identified as relevant to this subtopic, four classified as guidance and nine classified as practice (see Appendix 2, Table App 2.4).

##### *Guidance Summary*

Response configurations should be adjusted to allow for flexibility in prioritisation of calls for service. These could include basic algorithms for non-medically trained dispatchers or call referrals to recorded information, nurse triage hotlines, public health information lines, or other technology-based systems. Front-end triage should be used more frequently to limit the burden on health resources.

##### *Practice Summary*

In Egypt, an Integrated Interagency Triage Tool (pre-hospital, routine and mass casualty) was implemented to improve the management of COVID-19.<sup>(40)</sup> Bersano et al. reported on the activation of triage protocols in Italy to assess and manage suspected or confirmed cases of COVID-19.<sup>(44)</sup> Also in Italy, in Lombardy, the Agenzia Regionale Emergenza Urgenza (AREU) established two toll-free Public Safety Answer Points (PSAPs) for information and two support PSAPs to manage mid-low severity incidents in place of the regular ambulance PSAPs.<sup>(35)</sup>

In the SARS setting, after the report of the first probable SARS case in Taipei, the city EMS organised a special system for the transport of SARS cases or patients representing high risk.<sup>(1)</sup> SARS-related transports were categorised into 1) requests from hospitals for probable/ suspect cases of SARS, 2) quarantined individuals, and 3) febrile persons. In Toronto, Ontario, following the establishment of a Provincial Transfer Authorization Centre (PTAC) to coordinate, control, and track all inter-facility patient transfers during the SARS outbreak, a medical decision algorithm was designed to determine which inter-facility patient transfers could be approved. It was determined that the algorithm was highly sensitive and specific in properly

authorising inter-facility patient transfers during the outbreak.<sup>(4)</sup> A web-based application was also developed to request, process, and authorise patient transfers using a decision algorithm with 70% to 80% of requests capable of being processed using the web-based application.<sup>(3)</sup>

***5. Streamlining dispatch response (such as recommending self or no transport, assign less than usual response, diversion to alternate site, altered vehicle dispatch approach)***

A total of 14 relevant documents were identified, seven classified as guidance and seven classified as practice (see Appendix 2, Table App 2.5).

*Guidance Summary*

Various approaches were mentioned for the streamlining of dispatch responses. These ranged from gathering further information to improve response efficiency to recommendations regarding alternative arrangements for deployment of vehicles.

Local emergency centres should intensify inquiries during dispatch events and categorize dispatches accordingly, with assessment of illness severity determining resource activation. Local emergency centres should intensify inquiries during dispatch events and categorise dispatches accordingly, with assessment of illness severity determining resource activation.

In the event of EMS response capabilities becoming overwhelmed, a central dispatch or call centre may activate medically-approved dispatch protocols and pre-arrival instructions designed to alleviate the burden. These may include modified resource assignments, reduction of multi-unit responses (that is, minimising the deployment of multiple vehicles) unless clearly required, and assignment of units irrespective of level of care.<sup>(24)</sup>

Alternative transport, self-transport, no transport, and diversion to alternative care sites should be recommended if appropriate.<sup>(15)</sup> Additionally, assignment of non-traditional resources (e.g., using 'jump' cars, community paramedicine, and other responses) and alternative resources (e.g. assign law enforcement only on injury accidents unless and until clear information that non-ambulatory/critical injuries are present) should be considered.

Ambulance services in England are required to implement an Ambulance Case Transport Response Service (CTRS) to enable call receipt and dispatch of suspected or confirmed COVID-19 cases.<sup>(27)</sup> This service is to be implemented within each

ambulance trust, embedded in, or adjacent to, one of their emergency operations centres (EOC).<sup>(27)</sup>

### *Practice Summary*

Examples of streamlined dispatch responses were identified from various countries. In Milan, a COVID-19 response team determines the need for hospital admission, home isolation, or SARS-Cov-2 testing on the basis of risk factors for SARS-CoV-2 contagion and the clinical conditions of screened individuals.<sup>(48)</sup> In Geneva, a 24-hour sorting doctor was put in place at the start of the crisis.<sup>(51)</sup> This doctor systematically assesses, by videophone, patients who can stay at home, and provides assistance for allocating interventions to priority cases and directing care recipients to the most appropriate responses.<sup>(51)</sup> A report from the US stated that when a fire department in Central Illinois responds to calls pertaining to a known COVID-19 positive test, a 'quick response vehicle' is first sent with one paramedic to assess the situation before determining if more help is needed.<sup>(36)</sup> In the SARS setting, after the report of the first probable SARS case in Taipei, EMS dispatchers screened all EMS calls to acquire information on symptoms and any diagnosis of SARS and a dispatch priority for ambulance teams was put in place based on patient characteristics.<sup>(1)</sup> Other examples include a hybrid algorithm proposed to solve a quarantine vehicle scheduling problem for high-risk individual transfers in China.<sup>(53)</sup>

The potential for reduction of responses was also suggested in some cases. In Switzerland, a potential practice that was considered, should it become necessary, involved the disconnection of the local community's first-responder system, which allows citizen first responders to be alarmed in case of suspected cardiac arrest.<sup>(50)</sup> This measure would be taken due to potential risks of contamination for those responders that do not have special equipment and in a scenario of possible reduced capacity of hospitals to take care of cardiac arrest cases.

## **6. Telemedicine**

A total of six relevant documents were identified for this subtopic, three classified as guidance and three classified as practice (see Appendix 2, Table App 2.6).

### *Guidance Summary*

The use of telehealth and telemedicine for non-emergency health concerns should be encouraged. Considerations for the redirection of low urgency medical complaints to alternative medical resources such as nurse triage/call lines, telemedicine or paramedic triage should include<sup>(5)</sup>:



- Identify questions to be asked and the specific criteria the caller must meet to be transferred to alternative medical resources.
- For triage/call lines not already established: ensure notification of completion of training for nurse triage and dispatch centre staff. Aim to understand how the referral process will work and how processes may change due to evolving circumstances.
- If a medical resource call centre is not a 24 hours/7 days a week service, develop a working schedule and communicate often between the call centre and the dispatch centre.
- Work with emergency service providers to ensure call transfers can be made, while keeping the caller's call-back number.
- Ensure call transfer works both ways in the event that the call needs to be transferred back to the dispatch centre.

### *Practice Summary*

Video consultation has been applied in practice for COVID-19 related calls in France<sup>(43)</sup> and Switzerland.<sup>(51)</sup> Teleconferencing technology has also been used in Israel to initiate a consultation between the patient and a physician in Israel in the case of "green" calls (not requiring ambulance or mobile ICU).<sup>(41)</sup> Telemedicine is operational in both New Orleans and in New York City.<sup>(5)</sup>

## **'Workforce and Workplace' subtopics**

### ***7. Workforce capacity***

A total of 19 relevant documents were identified, ten classified as guidance and nine classified as practice (see Appendix 2, Table App 2.7).

### *Guidance Summary*

Staffing models should be modified with an increase in staff numbers if required (using volunteers, students, retirees, former workers) to manage large numbers of calls or a decrease in staff levels for the health of staff. Contingency plans should be activated; these should include preparation for potential staffing shortages and plans and processes to mitigate these shortages with sufficient numbers of trained personnel. Personnel training should be strengthened, but considerations should be given to the temporary suspension of telecommunicator certification or training requirements.

### *Practice Summary*

Call centre capacity has increased (call takers and dispatchers) in many countries<sup>(3, 34, 47, 49)</sup> and centres have been supported with students and retirees in France,<sup>(34)</sup> students in Switzerland<sup>(51)</sup> and volunteer physicians and medics in Italy.<sup>(35)</sup> A pending measure to deal with capacity constraint in Switzerland involves permitting the dispatch's medical director to downgrade the level of care (outside of protocol) from case to case when resources may be lacking.<sup>(50)</sup>

Many dispatch centre staff are continuing education and certification programmes online. This is allowing staff to maintain their certifications and expand their professional qualifications despite the pandemic.<sup>(38)</sup>

### ***8. Workforce health and well-being***

A total of nine relevant documents were identified, eight classified as guidance and one classified as practice (see Appendix 2, Table App 2.8).

#### *Guidance Summary*

Strategies and resources should be pre-identified to ensure behavioural health support for staff. The mental and physical health needs of staff should be considered and include the following:

- watch for atypical signs in staff behaviours and address as soon as possible.
- communicate with staff regarding new measures and provide information regarding available supports (e.g. peer support, employee assistance programme, employee wellness programme, Critical incident Stress Management (CiSM) support).
- develop formal/informal wellness plans.
- encourage EMS personnel to create structure at home to help create certainty and normalise the home.
- ensure staff take respective rest periods including active breaks.
- ensure staff have designated spaces for food and rest.
- restrict visitation to facilities.

Employees should be screened at the start of each shift and visitors should be screened for signs or symptoms of SARS-CoV-2. Staff who are feeling ill should be asked to stay at home and provided with information on EMS testing facilities.

The need for staff to care for family members should be recognised and facilitated with home working allowed for appropriate personnel and communication with families encouraged when possible.

Infection prevention and control measures should be implemented as follows:

- increase cleaning and disinfections approaches to include call answering points, desks, keyboards and screens
- ensure adequate cleaning and disinfection supplies are available to include extended shifts
- staff should not share personal equipment, e.g. headsets
- provide disinfecting hand gel at all entry/exit points, as well as warning notices
- develop just-in-time education for staff relative to infection prevention and control, self-care, transmission and family protection, and normal stress responses.

### *Practice Summary*

A survey by the National Emergency Number Association (USA) found nearly 75% of respondents indicated their call centre has taken measures to address employee wellness and stress during COVID-19.<sup>(37)</sup> Narrative responses indicate a diverse range of wellness measures (e.g. counselling, peer support, employee assistance programme, relaxed dress codes, counselling, providing meals).<sup>(37)</sup>

## ***9. Physical distancing or remote working***

A total of ten relevant documents were identified, five classified as guidance and five classified as practice (see Appendix 2, Table App 2.9).

### *Guidance Summary*

To ensure physical distancing and appropriate infection control, building access should be limited to employees only. Staff should be reminded that the potential for exposure to SARS-CoV-2 is not limited to direct patient care interactions and the importance of source control and physical distancing when engaged in non-patient care activities should be emphasised. US guidance recommends that staff should be separated or shifts organised to allow a distance of six feet, or the control room should be divided into several small clusters. Areas should be designated for staff to take breaks, eat, and drink that allow them to remain at least six feet apart. In-person meetings should be avoided unless essential – instead, methods or technological solution products such as webinars or Zoom/Skype/GoToMeeting should be used.

Home working should be implemented where possible, including remote call-taking/dispatching from home, if the available technology allows it.

Work-related travel should be suspended as well as employee personal travel and or self-isolation/quarantine guidelines should be instituted upon return.

### *Practice Summary*

In Switzerland, control unit access has been restricted as a first protective measure and remote working capacity has been increased.<sup>(51)</sup> Remote dispatch desks in private homes have also been set up and this also allows operators suspected or confirmed of having COVID-19, but who are still in good health, to continue working on a voluntary basis.<sup>(50)</sup> In Austria, staff are assigned to clusters and avoid meeting those outside their own cluster.<sup>(33)</sup> Data on numbers of staff working from home were reported as follows: 105/160 call takers; 22/28 back office personnel; and 15/15 technicians.<sup>(33)</sup> However, in the US, a survey by the National Emergency Number Association, which recommended the use of remote working, found that 64% of respondents reported that their call centre had no capability for remote call operations.<sup>(37)</sup> Only 30% reported that they can work remotely from a separate public-safety or government facility, and only 7% indicated the ability to do so from home.

## **'Governance and planning' subtopics**

### ***10. Resilience***

A total of eight relevant documents were identified, four classified as guidance and four classified as practice (see Appendix 2, Table App 2.10).

#### *Guidance Summary*

Stability should be aimed for as early as possible and learning from other affected areas can help with this.

There should be plans for if a COVID-19 case is identified among staff, including the management of anxiety and stress, as well as a plan where there is a need to temporarily close a centre for cleaning/disinfection. Time should be taken to ensure plans are communicated clearly. Backup equipment and sites should be tested and cybersecurity should be considered essential. The Collaborative Coalition for International Public Safety notes that cyber-attacks have increased in the context of COVID-19.<sup>(18)</sup>

### *Practice Summary*

Dispatch centres in the US have been prioritising upgrades, maintenance, and general readiness of backup sites with the expectation that, if a staff member were to test positive for COVID-19, the primary site would need to be shut down temporarily for cleaning and disinfection.<sup>(38)</sup> The National Emergency Number Association also recommends the use of remote working to improve resiliency for future pandemics or other crises, and encourages maintenance of cybersecurity and against foregoing installation of vendor upgrades.<sup>(37)</sup> In Switzerland, as a consequence of the large number of dispatchers who work in the Swiss system, but live on the French side of Lake Geneva, dispatch desks have been set up in France, in order to anticipate a possible total closure of the border.<sup>(50)</sup>

### ***11. Monitoring (COVID-19 or operations)***

A total of fifteen relevant documents were identified, nine classified as guidance and six classified as practice (see Appendix 2, Table App 2.11).

#### *Guidance Summary*

Dispatch centres should observe what is being done in other countries, especially those most affected. With respect to internal data, a mechanism should be established for collecting, aggregating and reporting data on calls. The following indicators should be monitored to aid planning and evaluation of the service, including staffing:

- call patterns
- number of potential COVID-19 cases identified
- staff illness (and mental health)
- staff availability

Data on the number of calls exclusively seeking information should be used to develop public service announcements. Computer-aided dispatch (CAD) data also provides insightful information for overall system surveillance. An updated list of available hospitals and beds should be kept and there should be a coordinated effort with agencies regarding availability of patient transportation means.

One document comprised a comprehensive checklist of pre-hospital emergency medical services 'readiness', allowing for continuous monitoring. The checklist identifies how complete the process of developing, validating and implementing procedures/protocols is, and the availability of recommended equipment, for each of the activities identified.<sup>(13)</sup>

### *Practice Summary*

The collection of data and monitoring of patterns in EMS calls may be used for surveillance of local epidemics and to aid health authorities in planning, monitoring, and ongoing quality and performance improvement.<sup>(40, 43)</sup> An algorithm developed by Milan's Emergency Medical System for the detection of suspected cases of COVID-19 is constantly updated to meet regional directives about hot zone extension and modalities for SARS-CoV-2 testing.<sup>(48)</sup> Business Intelligence has also been used in Italy to identify trends and patterns in calls received and can also be used to reallocate resources (vehicles and personnel) based on real-time data.<sup>(46)</sup> In the US, it was reported that iterative responses might help decrease COVID-19 exposure and conserve PPE; call patterns and requirements for PPE were monitored and adjustments were made over time to definitions of 'high-risk' patients and clinical criteria for identifying COVID-19, advisories regarding PPE use, and approaches to assessment of patients.<sup>(52)</sup> In Canada, the establishment of a Provincial Transfer Authorization Centre (PTAC) set up to coordinate, control, and track all inter-facility patient transfers in Ontario during the SARS outbreak, was considered to provide syndromic surveillance in real time and to provide the earliest indication of a potential threat to public health in acute and long-term care facilities.<sup>(4)</sup>

## **12. Information governance, protocols and procedures**

A total of fourteen relevant documents were identified; ten classified as guidance and four were classified as practice (see Appendix 2, Table App 2.12).

### *Guidance Summary*

Protocols, policies, procedures, continuity of operations and contingency plans may need to be developed, reviewed, revised and updated as required. Readiness should be monitored continuously; this includes monitoring websites of providers of EMS protocols for changes, and reviewing all internal and external resource contact numbers to ensure they are current.

Information sharing and consultation with other agencies and professional organisations is important to ensure operations are up to date with local policies. Existing relevant laws and regulations regarding adherence to existing protocols may need to be waived or suspended.

### *Practice Summary*

In one centre, process flow details for a new EMS transfer authorisation centre were developed on an ad-hoc basis, in real time, with continual refinement, but were

finalised within 12 hours.<sup>(3)</sup> In the US, EMS departments in the greater Richmond, Virginia area participate in conference calls six times per week to share information, respond to concerns, and stay connected with each other.<sup>(36)</sup> From the Swiss setting, Dami et al. report on the need to prepare and maintain protocols for downgrading of responses where resources are lacking.<sup>(50)</sup>

## Discussion

This review identified 52 documents relevant to the operation of emergency medical dispatch centres in the context of COVID-19 and beyond. Among these, 27 were classified as 'guidance', while 26 were classified as 'practice', including one document which fell into both categories. These international documents were published between February 2020 and July 2020, except for four reports which had been published previously on the experience of the SARS pandemic.

Among documents classified as 'guidance', the majority (22/27) were from sources with clear authority to provide guidance, and 13 were from US government institutions or US organisations involved in representing or providing emergency services. However, most documents did not explicitly use the term 'guidance' or 'guidelines' to describe the content. Furthermore, few documents primarily focused on the topic of emergency medical dispatch centres or provided guidance on varied operational aspects, and guidance often lacked detailed descriptions or in-depth consideration. Regarding the evidence base underpinning the documents, only one document cited research relating to efficacy or effectiveness; this guidance was considered to be non-authoritative. However, the document was published as an educational feature on an EMS website, as opposed to in a peer-reviewed journal. Twelve other 'guidance' documents were found to cite existing guidance as the basis for their recommendations; these largely cited WHO or CDC guidance.

Documents classified as 'practice', and coming from authoritative sources, included reports of survey results or reports of experience from several countries; one such document included a report of data and strategies observed across European countries. These reports considered aspects such as changes to arrangements for incoming calls (e.g. establishment of hotlines) to address higher call demand due to COVID-19, and approaches to managing workforce capacity and staff health and well-being. Documents from non-authoritative sources were published as academic manuscripts and included the four documents from the SARS setting. The non-authoritative documents frequently discussed the operation of emergency medical dispatch centres in the context of general pre-hospital emergency service provision, though some reported specifically on arrangements for handling increased call centre demand and improving dispatch efficiency.

A thematic framework, comprising three overarching themes, and containing 12 subtopics in total, was used to categorise the information found in the included documents. The first theme, 'COVID-19 pathways for response', contained the majority of the guidance and practice content, and included six subtopics: public messaging, call screening and communication regarding Persons Under



Investigation, arrangements for receiving calls, triage and prioritisation of calls, streamlining dispatch responses, and telemedicine. The 'Workforce and Workplace' theme considered workforce capacity, workforce health and well-being, and physical distancing or remote working arrangements. The 'Governance and planning' theme included the topics of resilience, monitoring (of COVID-19 or operations), and information governance, protocols and procedures.

Overall, the identified guidance largely comprised simple recommendations or short lists of points for consideration in planning services. For example, guidance on arrangements for receiving calls comprised recommendations for the redirection of non-emergency calls to other numbers, but in most cases little detail was provided on approaches. Nonetheless, corresponding examples of practice for this topic described experiences of various centres in setting up alternative call arrangements, including reports of the perceived success of such interventions. In Ireland, similar activities were undertaken at an early stage of the COVID-19 pandemic. The Report on Social Implications of COVID-19 in Ireland (Preliminary Assessment), published by the Department of the Taoiseach in May 2020, noted that the National Ambulance Service has implemented a dedicated COVID-19 dispatch centre, and has reinforced its clinical hub with additional doctors.<sup>(54)</sup> The service also implemented the 'Protocol 36' identification system, a protocol to allow staff on the 112/999 call system to identify patients who may be infected with SARS-CoV-2.<sup>(54)</sup>

Much of the guidance and practice identified in this review focused on approaches to managing increased demands for services in the midst of COVID-19, coupled with potential workforce capacity issues and the corresponding need for protection of staff, including remote working arrangements. The review identified little guidance which considered medium to long-term planning arrangements following COVID-19.<sup>(55)</sup> However, the 'Governance and planning' theme includes examples of such consideration. The importance of developing backup sites and strengthening infrastructure, including cybersecurity, were highlighted, as well as the importance of updating protocols and procedures to cater for the COVID-19 setting. Monitoring of incoming data and of processes in place were stressed as important for operational planning and for adjustment of approaches. Several organisations reported on innovative initiatives in this setting, for example the use of business intelligence approaches for establishing patterns in COVID-19 related calls.

It is possible that guidance for the medium-term or long-term setting is currently under development in different jurisdictions; for example, agenda documents from a 28 July 2020 board meeting of NHS England and NHS Improvement describe the development of a long-term plan for the future of urgent and emergency care services in the context of COVID-19.<sup>(55)</sup> The plan includes investment in call handling

capacity and refers to work to increase the proportion of 999 calls that can be managed without dispatching a vehicle, or that can be dealt with by a paramedic without onward conveyance to hospital. Additionally, the new '111 First' model, which involves urgent care telephone triage of patients in place of attendance at an emergency department, is described. These measures are described with reference to changing behaviour of citizens in the wake of COVID-19 and the need to ensure that emergency department crowding does not return to pre-COVID-19 levels.

The importance of the operation of emergency medical dispatch centres in the context of the COVID-19 response was highlighted in several of the included documents. For example, the concept of medical dispatch being the first link in the survival chain was expressed.<sup>(50)</sup> The Pan-American Health Organization underlined the importance of dispatch screening in particular, explaining its function in identifying COVID-19 patients under investigation based on the latest guidelines, assessing illness severity, and recommending the highest potential level of precautions that may be required.<sup>(6)</sup> These activities promote a safe environment for pre-hospital providers and permit resource allocation according to risk assessment, which may be de-escalated later where appropriate.<sup>(6)</sup> Several 'practice' documents referred to the potential for monitoring of EMS call data to inform overall public health disease surveillance efforts.<sup>(3, 40, 43)</sup>

The information presented in this review is subject to a number of limitations. For example, the categorisation of documents as 'authoritative', 'non-authoritative', 'guidance', or 'practice' is subject to interpretation. Similarly, describing guidance as 'thorough' or as containing a particular 'primary focus' is a subjective assessment. Furthermore, it is possible that not all guidance relevant to the remit of the review was included; documents were primarily gathered from the database produced for the initial [HIQA guidance review for pre-hospital emergency and patient transport services and COVID-19](#). The search process resulting in this database excluded documents where they were not targeted to pre-hospital emergency or patient transport services (or synonyms thereof) and general guidance was therefore not included. Also, in this original review, guidance was sought specifically in relation to the COVID-19 setting, though documents describing practice or 'lessons learned' included those relating to past respiratory virus pandemics (e.g. SARS, MERS, influenza A H1N1); 'guidance' from such past pandemics was expected to be obsolete or superseded by guidance for the COVID-19 setting and was therefore not included. Additionally, as the information relevant to this review is typically released by national-level bodies, a truly systematic search of guidance was not possible, though web searches were performed with the aim of capturing all recent guidance and a concerted effort was made to include guidance from ministerial, national and

professional associations relevant to the Irish healthcare setting. Importantly, this review includes only documents that were published on publicly accessible websites; internally released guidance documents are not included and if guidance was updated offline without publication, it will not be captured within the review.

Given the nature of the guidance documents identified in this review, it is difficult to make conclusions regarding the quality of the documents. These documents pertain to organisational and operational aspects of service provision and largely present pragmatic approaches not underpinned by evidence specific to COVID-19; the documents for the most part make no claim to represent 'guidelines' and few are prescriptive, instead providing 'information' or 'considerations'. The documents vary considerably in format, in focus and in detail. Furthermore, given the limited detail provided in the documents regarding the guidance development process, it is difficult to fully understand the document context and to assess the relevance and applicability of the document content to the Irish setting. Given the evolving nature of the COVID-19 pandemic, guidance may be subject to change and may not be transferable across jurisdictions at different time points.

## **Conclusion**

This review identified 52 documents from a range of international settings concerning the operation of emergency medical dispatch centres. These included 27 documents classified for the purposes of this review as 'guidance' and 26 classified as 'practice', including one document which was classified into both categories.

Guidance documents were largely high-level in nature, providing lists of recommendations as opposed to in-depth descriptions of approaches, and for the most part cited existing guidance to support the document content or did not refer to any evidence basis. Documents classified as 'practice' included reports of survey results and of experiences or approaches to providing emergency services during the pandemic. These included four documents from the SARS setting in addition to COVID-19 related documents. Guidance and practice were documented in this report under 12 subtopics within three main themes: 'COVID-19 pathways for response', 'Workforce and Workplace' and 'Governance and planning'.

The content of the documents largely referred to approaches to manage increased call volumes, while addressing workforce capacity, health and well-being. Little guidance was provided for medium-term or long-term planning concerns related to the evolving COVID-19 pandemic, though the importance of monitoring of both incoming data and service provision was frequently highlighted. As 'the first link in the chain of survival' and a potentially valuable source of data on patterns of calls

requesting information or assistance relating to COVID-19, emergency medical dispatch centres are a central and vital component of the ongoing response to COVID-19.

## Appendix 1

**Table App 1.1 Quality Assessment of included 'guidance' documents**

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>'-' indicates no basis is cited</i>	Detail of development of guidance
<b>Authoritative guidance</b>					
<b>Documents described as checklists</b>					
Prehospital Emergency Medical System Readiness: Checklist for COVID-19. Draft document, Version 2.3 (9 March 2020) <sup>(13)</sup>  <i>Pan American Health Organization and WHO Americas, 9 March 2020.</i>	<b>Expanded</b> checklist/points  <i>'Readiness tool'</i>	✓	-	Cites existing guidance	<i>'...Developed based on the experiences of pre-hospital emergency medical services during the responses to Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and influenza outbreaks.'</i>
COVID-19 PSAP Checklist(v3) <sup>(14)</sup>  <i>National Emergency Number Association, USA (date not reported)</i>	Checklist/bullet-point list  <i>'checklist'</i>	-	✓	-	(Nil)

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>'-' indicates no basis is cited</i>	Detail of development of guidance
COVID-19 Healthcare Planning Checklist <sup>(15)</sup>  Assistant Secretary for Preparedness and Response, US Department of Health and Human Services, 6 March 2020.	Checklist/bullet-point list  <i>'checklist'</i>	-	-	-	(Nil)
Resuscitation Academy: 10 Steps to Help Patients While Staying Safe <sup>(16)</sup>  Faculty of the Resuscitation Academy, 3 April 2020	Checklist/bullet-point list  <i>'10 steps'</i>	-	-	-	(Nil)
<b>Authoritative guidance (continued)</b>					
<b>Other documents</b>					
COVID-19 Best Practice Information: State, Local, Tribal and Territorial Governments: 9-1-1 Call Centers <sup>(31)</sup>  <i>Federal Emergency Management Agency (FEMA), USA, 21 July 2020</i>	<b>Expanded</b> checklist/points  <i>'Strategies, best practices for consideration'</i>	✓	✓	Cites existing guidance	<b>Note:</b> Document states the following: <i>'The following is a list of key findings and considerations as they relate to ongoing coronavirus (COVID-19) pandemic response operations across the country. These are best practices for consideration, and they do not constitute and should not be considered as guidance in any way.'</i>

<b>Document title</b>  <i>Organisation, date</i>	<b>Guidance type</b>  <i>As stated within document</i>	<b>Thorough guidance provided on emergency medical dispatch centre operations?</b>	<b>Emergency medical dispatch operations is primary focus of document?</b>	<b>Extent to which guidance is evidence based</b>  <i>'-' indicates no basis is cited</i>	<b>Detail of development of guidance</b>
	Note: states should not be considered as 'guidance'				
Redirecting 911 calls for information & low acuity medical complaints <sup>(5)</sup>  <i>Federal Healthcare Resilience Task Force, USA, 1 May 2020</i>	<b>Expanded</b> checklist/points  <i>'guidance and considerations'</i>	✓	✓	Cites existing guidance: 12 sources of guidance listed	(Nil)
NENA Recommendations for PSAPS & Emergency-Services Organizations During the COVID-19 Outbreak(v2) <sup>(17)</sup>  <i>National Emergency Number Association, USA (date not reported)</i>	Checklist/bullet-point list  <i>'Recommendations'</i>	✓	✓	-	(Nil)
Maintaining Dispatch Capabilities During a Pandemic <sup>(22)</sup>  <i>US Fire Administration, 14 April 2020</i>	Checklist/bullet-point list  <i>'Information'</i>	✓	✓	-	(Nil)

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>'-' indicates no basis is cited</i>	Detail of development of guidance
Global Recommendations for Emergency Services Organisations to manage the outbreak of COVID-19. A guide for public safety organisations & public safety professionals. <sup>(18)</sup>  <i>Collaborative Coalition for International Public Safety, 8 April 2020</i>	Checklist/bullet-point list  <i>'Recommendations'</i>	✓	✓	-	(Nil)
Prehospital Emergency Medical Services COVID-19 Recommendations <sup>(6)</sup>  <i>Pan American Health Organization and WHO Americas, 27 March 2020</i>	<b>Expanded</b> checklist/points  <i>'general guidance, recommendations'</i>	✓	-	Cites existing guidance	(Nil)
Covid-19: Practical guidance for implementation <sup>(11)</sup>  <i>International Liaison Committee on Resuscitation (ILCOR), (date not reported)</i>	<b>Expanded</b> checklist/points  <i>'Good practice statements'</i>	-	-	Cites existing guidance, and clarifies that such guidance is based on recent systematic review.	ILCOR performed a systematic review of evidence examining the risk to rescuers from patients in cardiac arrest, posted for public comment on 30 March 2020. ILCOR's Basic Life Support, Advanced Life Support and Paediatric Task Forces reviewed their existing guidance in light of that review and provided the insights and



<b>Document title</b>  <i>Organisation, date</i>	<b>Guidance type</b>  <i>As stated within document</i>	<b>Thorough guidance provided on emergency medical dispatch centre operations?</b>	<b>Emergency medical dispatch operations is primary focus of document?</b>	<b>Extent to which guidance is evidence based</b>  <i>'-' indicates no basis is cited</i>	<b>Detail of development of guidance</b>
					interim measures within the document as good practice statements.
Coronavirus Disease 2019 (COVID-19). Interim Guidance for Emergency Medical Services (EMS) Systems and 911 Public Safety Answering Points (PSAPs) for COVID-19 in the United States <sup>(7)</sup>  <i>Centers for Disease Control and Prevention (CDC), USA, 15 July 2020 (last updated)</i>	<b>Expanded</b> checklist/points  <i>'Recommendations'</i> <i>'Guidance'</i>	-	-	Cites existing guidance	<i>'This interim guidance has been updated based on currently available information about COVID-19 and the current situation in the United States.'</i>
PHECC COVID19 Advisory v2 <sup>(26)</sup>  Pre-hospital Emergency Care Council, Ireland, 4 June 2020 (last updated)	Letter/circular  <i>'Advisory'</i>	-	-	Cites existing guidance	Guidance is provided by the PHECC Medical Advisory Committee
COVID-19 Guidelines for Preparation & Response (Revision – March 4, 2020) <sup>(8)</sup>  <i>Global Medical Response Inc., USA, 4 March 2020</i>	<b>Expanded</b> checklist/points  <i>'guidelines'</i>	-	-	Cites existing guidance	States that the guidelines are based on CDC guidance for EMS services, available scientific evidence, operational best practices and expert consensus.

<b>Document title</b>  <i>Organisation, date</i>	<b>Guidance type</b>  <i>As stated within document</i>	<b>Thorough guidance provided on emergency medical dispatch centre operations?</b>	<b>Emergency medical dispatch operations is primary focus of document?</b>	<b>Extent to which guidance is evidence based</b>  <i>'-' indicates no basis is cited</i>	<b>Detail of development of guidance</b>
COVID-19: Considerations, Strategies, and Resources for Emergency Medical Services Crisis Standards of Care <sup>(24)</sup>  <i>Federal Healthcare Resilience Task Force, USA, 25 April 2020</i>	<b>Expanded checklist/points</b>  <i>'general considerations'</i>	-	-	Cites existing guidance	(Nil)
European Society For Emergency Medicine position paper on emergency medical systems' response to COVID-19 <sup>(19)</sup>  <i>European Society for Emergency Medicine, 1 April 2020</i>	<b>Expanded checklist/points</b>  <i>'Position paper, recommendations'</i>	-	-	-	(Nil)
COVID-19 Ambulance Case Transport Response Service Framework <sup>(27)</sup>  <i>NHS England, 22 February 2020</i>	<b>Expanded checklist/points</b>  <i>'framework for minimal operating standards'</i>	-	-	-	(Nil)
NHC to enhance pre-hospital medical services amid regular epidemic control <sup>(28)</sup>	Letter/circular  <i>'requirements'</i>	-	-	-	(Nil)

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>- indicates no basis is cited</i>	Detail of development of guidance
<i>National Health Commission, China, 17 July 2020</i>					
Coronavirus Disease 2019 (COVID-19): Standard Operating Procedure (SOP) for transporting a suspect/confirmed case of COVID-19 <sup>(29)</sup>  <i>Ministry of Health, India, 29 March 2020</i>	SOP  <i>'standard operating procedure'</i>	-	-	-	(Nil)
Public Service Answering Points (PSAPs)/Emergency Communications Centers (ECCs) Call Screening <sup>(9)</sup>  <i>Federal Healthcare Resilience Task Force, USA, 14 April 2020</i>	Checklist/bullet-point list  <i>'Procedural guidance'</i>	-	-	-	(Nil)
Considerations for State Emergency Medical Service (EMS) Offices in Response to COVID-19 <sup>(25)</sup>  <i>Federal Healthcare Resilience Task Force, USA, 14 April 2020</i>	Checklist/bullet-point list  <i>'considerations'</i>	-	-	-	(Nil)

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>'-' indicates no basis is cited</i>	Detail of development of guidance
Maintaining Emergency Medical Services Capabilities During a Pandemic <sup>(23)</sup>  <i>US Fire Administration, 13 April 2020</i>	Checklist/bullet-point list  <i>'Information'</i>	-	-	-	(Nil)
<b>Non-authoritative guidance</b>					
Managing Stress During COVID-19 <sup>(20)</sup>  <i>Lee et al., 6 June 2020</i>	<b>Expanded</b> checklist/points  <i>'recommendations'</i>	-	-	<b>Cites apparent evidence</b> for efficacy or effectiveness.	(Nil)
Temporary Emergency Guidance to STEMI Systems of Care During the COVID-19 Pandemic: AHA's Mission: Lifeline <sup>(10)</sup>  <i>The American Heart Association, 2 May 2020</i>	<b>Expanded</b> checklist/points  <i>'guidance'</i>	-	-	Cites existing guidance	(Nil)
Recommendations for Prehospital Airway Management in Patients with Suspected COVID-19 Infection <sup>(21)</sup>	<b>Expanded</b> checklist/points  <i>'recommendations'</i>	-	-	Cites existing guidance	States that recommendations were established through review of the current literature.

Document title <i>Organisation, date</i>	Guidance type <i>As stated within document</i>	Thorough guidance provided on emergency medical dispatch centre operations?	Emergency medical dispatch operations is primary focus of document?	Extent to which guidance is evidence based  <i>'-' indicates no basis is cited</i>	Detail of development of guidance
<i>Hart et al., 15 June 2020</i>					
Integration of aeromedicine in the response to the COVID-19 pandemic <sup>(12)</sup>  <i>Osborn et al., 26 May 2020</i>	Report  <i>'development of guidance'</i>  <i>(Note: this document was classified as both guidance and practice)</i>	-	-	Cites existing guidance	Document describes a response, including the development of the guidance for same. This included a literature review, followed by identification and inclusion of key stakeholders in a working group for guidance development.
Prehospital Triage of Acute Stroke Patients During the COVID-19 Pandemic <sup>(30)</sup>  <i>Goyal et al., and on behalf of the AHA/ASA Stroke Council Science Subcommittees: Emergency Neurovascular Care (ENCC), the Telestroke and the Neurovascular Intervention Committees, 13 May 2020</i>	Review  <i>'statement paper'</i>	-	-	-	(Nil)

## Appendix 2. Analysis by theme and subtopic

### 'COVID-19 pathways for response' subtopics

**Table App 2.1 Public Messaging**

Public messaging		
Organisation	Country	Guidance or Recommendations
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	Develop public messages that emphasize using 911 only for life-threatening emergencies and coordinate with the joint information system.
NENA <sup>(17)</sup>	USA	Consider the use of pre-recorded messages in PSAPs to redirect callers to call a non-emergency medical helpline for Covid-19 information / medical advice.
US Fire Administration (USFA) <sup>(23)</sup>	USA	Inform the public through your joint information system.
US Fire Administration (USFA) <sup>(22)</sup>	USA	Plan to educate the community; decrease expectations for care.
Collaborative Coalition for International Public Safety <sup>(18)</sup>	Global	<p>Leave emergency numbers for acute cases. Use either some or all of these options:</p> <ul style="list-style-type: none"> <li>▪ Set up a free of charge dedicated information number for general questions about COVID-19, which should be available 24/7. If possible, make this a short number (3-5 digits), easy to remember and properly advertised. Make sure enough information is available online (dedicated websites, apps) and that this is well communicated.</li> <li>▪ Use a non-emergency medical helpline (such as 116 117 in Germany or 311 in the USA).</li> <li>▪ Ask citizens to call General Practitioners (GPs) directly / first.</li> <li>▪ Consider the use of Interactive Voice Response (IVR) in PSAPs to remind callers to call another number for COVID-19 information / medical advice.</li> </ul> <p>Communication with the public:</p> <ul style="list-style-type: none"> <li>▪ Keep messages as simple, clear and coherent as possible.</li> </ul>

		<ul style="list-style-type: none"> <li>▪ Dedicate time to adapting and readapting to the situation, but ensure decisions are clearly communicated to citizens. This may require avoiding too many changes of plans and trying to put in place stable measures as early as possible.</li> <li>▪ Use multi-channel public warning with clear and coherent messages to avoid misinformation. Consider sending localised messages in addition to nation-wide alert, if technology enables it.</li> <li>▪ Consider providing information in different languages.</li> </ul> <p>Make sure your information number and/or medical line number are accessible. This also applies from abroad so that your citizens currently abroad can reach them.</p> <p>Make all information and emergency services accessible to people with disabilities</p> <p>Be aware that misinformation and disinformation can pose significant problems.</p> <ul style="list-style-type: none"> <li>▪ When communicating, ensure that all information is factual and reliable.</li> <li>▪ Ensure that the reliable information reaches as much of the population as possible, to reduce the impact of disinformation.</li> <li>▪ Communicating concise, regular and accurate information to the public can help to ensure that panic and sense of insecurity does not increase.</li> <li>▪ Emergency services can also play a role in dispelling rumours by disproving harmful content publicly. For instance, the emergency medical services of Lille, France, took actions to counter false information that was spread about them.</li> <li>▪ Examples of the problems caused by disinformation include: helplines being congested in Czechia due to rumours that the lines were answered by epidemiologists and rumours in the UK that the outbreak was caused by 5G.</li> </ul>
NENA <sup>(14)</sup>	USA	Create media messages including social media messages to assist the public accessing assistance and information – include any agency services that have been suspended.
Riou B. The COVID-19 APHP-Universities-INRIA-INSERM Group <sup>(43)</sup>	France	To cope with the surge of calls during the COVID-19 crisis, the four EMS services involved in the study increased their response capacity by creating specific procedures for COVID-19-related calls. These included staff increase, dedicated computer stations, interactive voice server, video consultation, and sending instructions by SMS.
Jensen T., et al <sup>(42)</sup>	Denmark	The Copenhagen EMS in Denmark implemented a separate coronavirus hotline followed by a web-based self-triage system (WBSTS) to reduce nonemergency call volume. Awareness of the WBSTS and the coronavirus hotline was initially disseminated to the public through a press release by the Copenhagen EMS, the Capital Region and the websites and social media channels (Twitter® and Facebook®) of hospitals in the region.

**Table App 2.2 Call screening for COVID-19 symptoms and PUI communication**

<b>Call screening (for COVID-19 symptoms) and PUI communication</b>		
<b>Organisation</b>	<b>Country</b>	<b>Guidance or Recommendations</b>
Federal Healthcare Resilience Task Force EMS/Pre-hospital Team <sup>(9)</sup>	USA	<p>For all requests for emergency care (including inter-facility transports) the dispatcher/call taker should ask the following questions:</p> <ul style="list-style-type: none"> <li>▪ Has the Patient had a positive COVID-19 test?</li> <li>▪ Is the Patient a COVID-19 Person Under Investigation (PUI)? – (PUI is defined as a patient who has been tested for COVID-19 but has not received their result).</li> <li>▪ Does the patient have flu-like symptoms (fever, chills, tiredness, cough, muscle aches, headaches, sore throat or runny nose)?</li> </ul> <p>The dispatcher/call taker should document any positive findings in their report. NOTE: Recent travel is no longer a recommended question</p>
Federal Healthcare Resilience Task Force EMS/Pre-hospital Team <sup>(24)</sup>	USA	<p>As care is stratified during the COVID-19 response, more front-end triage of patient complaints should be performed to limit the burden on healthcare resources. Potential Strategies: <i>Call-Taking</i></p> <ul style="list-style-type: none"> <li>▪ Caller Screening: Add specific caller queries for COVID-19 like symptoms (i.e., fever, cough, shortness of breath, etc.).</li> </ul>
Federal Healthcare Resilience Task Force EMS/Pre-hospital Team <sup>(25)</sup>	USA	<p>Provide guidance on potential strategies for managing limited EMS resources, including:</p> <ul style="list-style-type: none"> <li>▪ Caller screening, triage, and prioritized dispatch.</li> </ul>
Global Medical Response Inc. <sup>(8)</sup>	USA	<p>Dispatch / Call Centers should coordinate with municipalities, local EMS authorities, state and local public health, other PSAPs, and other emergency call centers to determine the need for modified caller queries about COVID-19, outlined below.</p> <p>Development of these modified caller queries should be closely coordinated with an EMS medical director and informed by local, state, and federal public health authorities, including the city or county health department(s), state health department(s), and Centers for Disease Control and Prevention where applicable.</p> <p>PSAPs or Emergency Medical Dispatch (EMD) centers (as appropriate) should question callers and determine the possibility that this call concerns a person who may have signs or symptoms and risk factors for COVID-19. The query process should never supersede the provision of pre-arrival instructions to the caller when immediate</p>



		lifesaving interventions (e.g., CPR or Abdominal thrusts) are indicated. Patients in the US who meet the appropriate criteria should be evaluated and transported as a PUI. Information on COVID-19 specific questions will be updated as the public health response proceeds.
Ministry of Health <sup>(29)</sup>	India	Call Centre: On receiving the call, the call centre needs to enquire regarding the following details: a) Demographic details of the patient i.e. name, age, gender etc. b) Ascertain whether the patient is suspect case of COVID-19: i. Symptoms of patient: Ask whether the patient is suffering from fever, cough and difficulty in breathing ii. Ask whether patient has recently returned from a foreign country iii. Ask whether the patient was under home quarantine as directed by local health administration c) Clinical condition of patient to be transported: whether stable or critical
Faculty of the Resuscitation Academy <sup>(16)</sup>	USA	There are 2 key categories for interrogating all callers: <ul style="list-style-type: none"> <li>▪ Premise history: What is the address? Is it a “high-risk” facility, or has it been designated by premise information as a known COVID-19 location?</li> <li>▪ Patient: Does the patient have any respiratory symptoms—i.e., cough, shortness of breath, or difficulty breathing? Does the patient have a fever or sore throat?</li> </ul>
European Society for Emergency Medicine <sup>(19)</sup>	Europe	Calling the pre-hospital system: The patient, relative or general practitioner may alert the emergency number indicating that a potential case of SARS-CoV-2 infection with severe symptoms is seeking care. Other online phone systems for health consultation should be used in non-severe cases. Pre-alerting the emergency department is recommended in order to facilitate preparation for patient management.
Pan American Health Organization & WHO Americas <sup>(6)</sup>	Pan American Health (Americas)	Every caller reporting a patient with fever and/or signs/symptoms of lower respiratory illness (cough, shortness of breath) must be screened further. At the time of activation, dispatchers should inform the responding EMS crew of the patient’s illness/symptoms and concern for COVID-19 (Post-dispatch Information Protocol). Once notified, responding EMS will take appropriate precautions and prepare for the treatment and transport of a PUI.
American Heart Association authors <sup>(10)</sup>	USA	In attempts to mitigate exposure, the Centers for Disease Control and Prevention recommend Emergency Medical Dispatch centers or 911 Public Safety Answering Points dispatchers triage callers, utilizing a series of questions to identify patients (and anyone in the home) who may be experiencing coronavirus signs and symptoms and share this information with pre-hospital first responders.
Hart et al. <sup>(21)</sup>	USA	Screening of patients for possible PUI status should begin with 911 dispatch and other public safety answering points. Screening for COVID-19 infection should include the following: history of foreign travel or travel to current hotspots identified by the Centers for Disease Control and Prevention; close contact (less than 6 ft. for more than 10 minutes) of a known COVID-19 positive patient or PUI; or to a person with a flu-like illness with worsening dyspnea, body

		aches, sore throat, non-productive cough, and/or gastrointestinal symptoms. If no screening information has been provided, precautions should be taken when responding to any patient who reports dyspnea or flu-like illness. Suspicion of a possible PUI by dispatch, or after on-scene evaluation, should be communicated to the receiving hospital.
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	<p>When SARS-CoV-2 infection is suspected in a patient needing emergency transport, pre-hospital care providers and healthcare facilities should be notified in advance that they may be caring for, transporting, or receiving a patient who might have SARS-CoV-2 infection.</p> <p><u>Modified Caller Queries</u>  911 Public Safety Answering Points/Emergency Communication Centers (PSAP/ECCs) should question callers and determine whether the call concerns a person who might have SARS-CoV-2 infection (e.g., ask about signs and symptoms of COVID-19 or recent close contact with someone with SARS-CoV-2 infection). The query process should never supersede the provision of pre-arrival instructions to the caller when immediate lifesaving interventions (e.g., CPR or the Heimlich maneuver) are indicated.</p>
Pan-American Health Organization <sup>(13)</sup>	(Pan-American)	<p><i>(Checklist instrument developed to help countries confirm the readiness of their pre-hospital emergency medical services to respond to COVID-19, identifying immediate and priority actions aimed at responding to the emergency in an efficient and timely manner. The checklist is focused on 4 components of the pre-hospital emergency medical services.)</i></p> <p>Checklist component: Call management  Action: The call protocol has an up-to-date questionnaire that includes COVID-19 symptoms and risk factors for (e.g., history of travel to affected areas), based on case definition.</p> <p>Component: Call Management  Action: Identified and established mechanisms for communication/coordination with authorities at health services and points of entry, for case reporting and transportation of patients.</p>
Federal Emergency Management Agency (FEMA) <sup>(36)</sup>	USA	<p>Coordination between local health departments, emergency services, and other Public Safety Answering Points (PSAPs) is crucial for increasing the efficiency and effectiveness of COVID-19 response operations.</p> <p>Potential Best Practice: In Michigan, when the COVID-19 status of an area or residence is unknown, 9-1-1 dispatchers ask callers questions to determine the potential risk of COVID-19 exposure prior to dispatch.  Potential Best Practice: The State of Kansas Department of Health and Environment’s guidelines emphasize that close coordination and consistent communications between all components of the health system, including PSAPs, the EMS system, healthcare facilities, and the public health system, are needed to ensure all parties are notified in advance that they may be caring for a patient with COVID-19.</p>

Murphy et al. <sup>(52)</sup>	USA	After 28 February (date of first confirmed case in King County, Washington, Seattle), EMS updated the high-risk criteria to include the first long-term care facility (LTCF) where initial cases were identified, with dispatch to alert "PPE advised" for any response to the address. After additional cases were identified at a second LTCF and a dialysis center, these sites were added as high-risk locations for dispatch. A growing list of LTCFs and congregate living centers soon followed. Beginning 7 March, EMS began to treat all LTCFs (skilled nursing facilities, assisted living facilities and adult family homes) as high-risk requiring full PPE, regardless of clinical illness profile.
Spina et al. <sup>(48)</sup>	Italy	<p>The EMS of the metropolitan area of Milan instituted a COVID-19 Response Team of dedicated and highly qualified personnel, with the ultimate goal of tackling the viral outbreak without burdening ordinary EMS activity. The team is active at all times and consists of 10 healthcare professionals supported by 2 technicians. On the basis of caller needs, the receiver operators of the primary PSAP dispatch calls to either the ordinary EMS for primary medical assistance or to the COVID-19 response team for the assessment of risk factors for SARS-CoV-2 infection.</p> <p>The COVID-19 Response Team collaborated with regional medical authorities to design a procedural algorithm for the detection of suspected cases of COVID-19. Patients were screened for: (1) domicile or prolonged stay in the hot zone (ie, where COVID-19 cases first appeared), or both; (2) close contact with suspected or confirmed cases of COVID-19; and (3) close contact with patients with respiratory symptoms from the hot zone or China.</p>
Semeraro et al. <sup>(47)</sup>	Italy	Dispatch centres were implemented with dedicated Public Health Physicians (PHPs) able to interrogate and interact with patients and call takers about 2019-nCoV infection. Furthermore, PHPs were then integrated in dispatch issues, in order to help centralize suspected and confirmed 2019-nCoV patients. Eventually, PHPs became available for consultation by all EMS crews.
Chow-in Ko et al. <sup>(1)</sup>	Taiwan	After the report of the first P-SARS case in Taipei, the city EMS organized a special system for the transport of SARS cases or patients of high risk. EMS dispatchers screened all EMS calls with a unified protocol to acquire information on the occurrence of fever, quarantine status, and any diagnosis of SARS.
Lateef et al. <sup>(2)</sup>	Singapore	When there were uncertainties about the history, especially of a possible SARS contact, or which hospital to send the patient to, paramedics could clarify with the personnel at the control center in the Singapore Civil Defence Force or the emergency physician at the receiving hospital. Checks were also made with the SARS hotline set up by the Ministry of Health through the control room, which had access to patients who were on home quarantine orders (HQO). The patients on HQO also used the SARS ambulance service when they had to seek medical attention for any reason. These people had been advised not to use public transportation or to drive themselves to the hospitals to reduce any chance of infecting others.
Osborn et al. <sup>(12)</sup>	USA	Centers for Disease Control and Prevention guidance for public-safety answering points and emergency medical dispatch centers includes recommendations that dispatchers should modify caller screening questions to include

COVID-19 questions and notify EMS clinicians as early as possible prior to patient contact. This was implemented with our dispatch team and flight crews for all calls, including scene flights. Each request for transport of a COVID-19 or PUI patient is first screened by dispatch, then discussed with the Chief Flight Nurse and Medical Director for both safety and appropriateness.

The following list of screening questions was utilized to help identify HCID patients:

- Does the patient have a temperature  $\geq 100.1$ ?
- Does the patient have new onset of coughing?
- Does the patient have nasal congestion unrelated to allergies?
- Does the patient have a sore throat?
- Does the patient have shortness of breath, unrelated to chronic disease?
- Does the patient have new onset of diarrhoea?
- Is the patient living with someone who is under mandated 14-day quarantine for COVID-19 exposure?
- Does the patient have a known contact with someone with COVID-19?

If any answers to the above questions were yes, guidance was given to contact the Chief Flight Nurse in order to dispatch the designated COVID-19 crew.

**Table App 2.3 Call-taking arrangements**

Call-taking arrangements		
Organisation	Country	Guidance or Recommendations
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	Prepare to initiate auto-answer/ recorded answering of 911 calls including diversion of information or non-emergency calls to another call center (e.g., public health hotline). Consider activating a community hotline if such a call center does not exist.
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(24)</sup>	USA	As care is stratified during the COVID-19 response, more front-end triage of patient complaints should be performed to limit the burden on healthcare resources. Use pre-recorded messages to filter calls that require direct contact with a call-taker and refer callers with a non-acute illness to non-emergency resources.
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(25)</sup>	USA	Provide guidance on potential strategies for managing limited EMS resources, including: <ul style="list-style-type: none"> <li>▪ Referral or redirection of calls to non-emergency resources.</li> </ul>
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(5)</sup>	USA	Document provides detailed guidance for the redirection of callers requesting COVID-19 information to local and state health departments, COVID-19 hotlines, websites, links, and non-emergency lines such as 311, 211, 411 or other 10-digit lines. Provides detailed administrative, technical and operational guidance points.
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	Ascertain if any changes can be made to lighten the non-emergency load on telecommunicators, e.g., activate an alternate center, redirect some or all non-emergency calls.
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	Leave 911 for acute cases using some or all of the following options: <ol style="list-style-type: none"> <li>a. Set-up a dedicated information number free of charge, which should be available 24/7. Make sure enough information is available online (dedicated websites, apps) and that this is well communicated.</li> <li>b. Use a non-emergency medical helpline</li> <li>c. Ask citizens to call Primary Care Physicians directly/first</li> </ol>

US Fire Administration (USFA) <sup>(23)</sup>	USA	Redirect appropriate calls to the pandemic hotline.
US Fire Administration (USFA) <sup>(22)</sup>	USA	Plan for a single point of service in the community. Plan for telephone trees, hotlines, information lines, additional trunk lines and potential lines for dispatchers telecommunicating.
European Society for Emergency Medicine <sup>(19)</sup>	Europe	Calling the prehospital system: The patient, relative or general practitioner may alert the emergency number indicating that a potential case of SARS-CoV-2 infection with severe symptoms is seeking care. Other online phone systems for health consultation should be used in non-severe cases.
Collaborative Coalition for International Public Safety <sup>(18)</sup>	Global	<p>Leave emergency numbers for acute cases. Use either some or all of these options:</p> <ul style="list-style-type: none"> <li>▪ Set up a free of charge dedicated information number for general questions about COVID-19, which should be available 24/7. If possible, make this a short number (3-5 digits), easy to remember and properly advertised. Make sure enough information is available online (dedicated websites, apps) and that this is well communicated.</li> <li>▪ Use a non-emergency medical helpline (such as 116 117 in Germany or 311 in the USA).</li> </ul> <p>Consider updating your call-taking protocols to filter and divert non-emergency COVID-19 related calls sooner and to ensure Emergency Medical Services (EMS) control room staff are available to deal with acute cases. For instance, Lombardy (Italy) has published a tree filter for 112 control room staff, Florida (USA) has published guidelines on 911 call handling, Tracy Police Department (USA) has published examples of triage processes.</p> <p>Consider forwarding calls to another emergency call centre of the same discipline or forwarding emergency calls to another call centre.</p> <p>Consider involving other disciplines to filter some or all calls related to COVID-19.</p> <p>Consider and prepare for the impact that the outbreak and measures such as lockdowns may have on other services, such as hotlines for domestic violence, children, mental health and suicide.</p>
Pan-American Health Organization <sup>(13)</sup>	(Pan-American)	<p><i>(Checklist instrument developed to help countries confirm the readiness of their pre-hospital emergency medical services to respond to COVID-19, identifying immediate and priority actions aimed at responding to the emergency in an efficient and timely manner. The checklist is focused on 4 components of the pre-hospital emergency medical services.)</i></p> <p>Component: Call Management</p> <p>Action:</p> <ul style="list-style-type: none"> <li>▪ Ensure that calls are properly routed to 911 or other emergency medical dispatch centers to activate EMS resources.</li> <li>▪ Availability of a technological platform for correct classification of alerts, call management, and information management.</li> </ul>

Federal Emergency Management Agency (FEMA) <sup>(31)</sup>	USA	<p>Establish a coordinated call center system to divert non-emergency calls from a community's 911 system, and non-critically ill patients away from the emergency healthcare system. A coordinated call center system allows multiple agencies and organizations to share the high load of calls during a pandemic by integrating components of those organizations such as call centers, information lines, and crisis centers.</p> <p>Establish a call center devoted to COVID-19-related inquiries to alleviate call volume from 9-1-1 operators. Manage and direct the "worried well" (those who are calling for information or non-emergency advice) to a non-emergency, non 9-1-1 call queue as quickly as possible to prevent 9-1-1 system overload.</p>
Goyal et al. <sup>(30)</sup>	Canada	Establishment of local coordination centres is encouraged and could facilitate routing of confirmed or suspected COVID-19 positive stroke patients to a hospital with the required critical care facilities.
European Emergency Number Association (EENA) <sup>(35)</sup>	Italy	AREU (Azienda Regionale Emergenza Urgenza which translates from Italian as Regional Emergency Company) established two toll-free PSAPs to provide information.
Notruf Niederosterreich <sup>(33)</sup>	Austria	<p>A previously established low level hotline (145) for health advice was used successfully for COVID-19 as evidenced by the number of calls to that number. Call takers assigned solely for COVID-19.</p> <p>Call takers could assign the call to 'Emergency' or 'Nurse Triage' if required.</p> <p>Web Call Assist used to triage calls to 1450 (telephone health advice service) for COVID testing.</p>
Mowafi H., et al. <sup>(40)</sup>	Egypt	<p>A survey of EMR (Eastern Mediterranean Region) ministry of health websites, personal communications with ministry of health staff, and reviews of public news reports reveal that 20/22 EMR member-states (and Palestine) have established ad hoc national or regional COVID-19 hotlines for the public to access information, report suspected cases, and be screened for symptoms of COVID-19. Early reports indicate widespread utilization of these hotlines with Egypt registering more than 40,000 calls per day, prompting the creation of an integrated smartphone application that has been downloaded by over 1 million Egyptians.</p> <p>Overwhelming public demand in the United Arab Emirates for access to COVID-19 information has led to the creation of a WhatsApp account powered by artificial intelligence to answer the large number of public inquiries. The creation of COVID-19 hotlines and the widespread public use of these numbers present an opportunity to maintain this architecture to create emergency access numbers for system activation in countries where this has been lacking.</p>
Maudet et al. ( <i>Note: Document translated from French using Google Translate</i> ) <sup>(51)</sup>	Switzerland	The management of urgent health calls (via the emergency number 144) – the first link in the survival chain - must remain operational in all circumstances. One of the risks identified in a crisis situation is being inundated with calls and no longer being able to respond and prioritize resources towards vital emergencies. The cantons have therefore set up specific telephone lines to protect the emergency centers. Despite this, the volume of calls to the centres increased (from 2 to 5 times more for the 144 Vaud-Neuchâtel and Geneva centres), while the volume of engagement of relief increased, but to a much lesser extent.

Riou B. The COVID-19 APHP-Universities-INRIA-INSERM Group <sup>(43)</sup>	France	To cope with the surge of calls during the COVID-19 crisis, the four EMS services involved in the study increased their response capacity by creating specific procedures for COVID-19-related calls. These included staff increase, dedicated computer stations, interactive voice server, video consultation, and sending instructions by SMS.
Jensen T., et al <sup>(42)</sup>	Denmark	<p><u>Summary</u> The Copenhagen EMS in Denmark implemented a separate coronavirus hotline followed by a web-based self-triage system (WBSTS) to reduce nonemergency call volume. Creating a coronavirus hotline staffed by healthcare personnel seemed to have an impact on call volume and potentially relieved the strain in resources, while the WBSTS was widely used and could be further developed to reach its full potential.</p> <p><u>Description of intervention</u> The hotline was launched on 4 March 2020, as a separate queue system and was established as a standalone call centre on 9 March. The hotline was staffed by 5–18 persons at peak, all with a healthcare-related educational background (e.g., nurses, medical students, and medical doctors). The staff were instructed to follow a protocol resulting in the algorithmic placement of responses. The caller could eventually be given advice on actions or self-isolation or be directed to the emergency line for triage. All callers who contacted the 1813 medical helpline were presented with the option to either go to the coronavirus hotline if they were calling concerning COVID-19 or continue to the normal EMS if their call concerned other emergent medical issues. All calls regarding life-threatening emergencies were directed to call the 1122 emergency line.</p> <p>The development of the WBSTS was initiated on 12 March, and the system was ready to launch 3 days later. A simple algorithm based on the triage of potential COVID-19-infected patients was designed and implemented as an online web application for inclusion on the already-established Copenhagen EMS webpage and initiated on 15 March.</p> <p><u>Results</u> In peak periods, the coronavirus hotline had a call volume that was similar to that of the EMS 1813 medical helpline and thus relieved the burden; the 1813 call volume returned to operating capacity after the burden was cut almost in half.</p> <p>The WBSTS was widely used with more than 107,000 users from its launch until 27 March. However, no apparent effect on call volume was indicated or documented. Users were mainly younger adults (median 42 years, IQR 31–54 years). The WBSTS was limited in interaction, and as expected, not all symptoms were presented; consequently, some potentially infected persons could have been missed.</p> <p>The authors found that 85.4% of WBSTS entries presented with mild or no relevant symptoms, and a proportion of these entries could have potentially overloaded the EMS (accounting for up to 92,141 additional calls). Of the 3 possible types of advice that could be offered, the WBSTS advised 24.0% (21,186 calls) of users that they had</p>



		<p>reported symptoms of COVID-19, 35.3% (31,112 calls) of users were advised to self-isolate, and 40.7% (35,956 calls) were advised to call the EMS and coronavirus hotline.</p> <p><u>Future directions</u> The authors aim to evaluate the effort and further develop an actual active “chatbot” to relieve the EMS of cases with no or mild symptoms and the corona helpline by providing counselling for common questions to improve triage without impeding access for those in need.</p>
Semeraro et al. <sup>(47)</sup>	Italy	<p>In order to support the Emilia Ovest dispatch centre, all the calls from the Reggio Emilia province (usually managed from the Emilia Ovest dispatch centre) were diverted to the Emilia Est centre up to 25 February. On 25 February the ER (Emilia Romagna) Region was provided with a dedicated number for 2019-nCoV.</p>
Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	<p>State and nationwide dedicated information helplines were set up from 6 March to answer general questions about COVID-19. Lesson learned: a non-emergency medical dispatch and specific help lines may save a dispatch centre from becoming overwhelmed.</p>
Lateef et al. <sup>(2)</sup>	Singapore	<p>During this outbreak, a separate dedicated SARS ambulance service was set up to transport all non-emergency suspected and probable cases to the designated SARS hospital. This was a free service with a simple single access number, 993. This “ring fence” strategy was in place to reduce the likelihood of cross-infection.</p>
European Emergency Number Association (EENA) <sup>(34)</sup>	Various	<p><u>Creation of dedicated hotlines</u> In Croatia, a new national hotline 113 was created to answer citizens’ questions regarding COVID-19. In Cyprus, 2 new hotlines were launched. In Estonia, a new information helpline 1247 was also created. In Poland 2 helplines were activated for Polish people living or travelled recently to the Northern Italy.</p> <p>Some countries have several hotlines according to region: Germany has separate COVID-19 hotlines in different federal states, as well as national hotlines. In Italy, regional toll-free numbers were established to answer questions about COVID-19. Finland has a national information number about COVID-19 (via phone and via chat) and an additional numbers for Helsinki and Lapland areas. The Portuguese archipelagos (Madeira and Azores) have their own information lines for questions related to COVID-19. Jersey (Channel Islands) has launched a COVID-19 helpline.</p> <p><u>Online services</u> In Spain apps have been launched as an alternative to calling. The UK is urging people only to call the non-emergency 111 number if they cannot access the online 111 service. An update to the 111 service was launched to help people get quick advice about COVID-19.</p>

Jaffe et al. <sup>(49)</sup>	Israel	<p>The national EMS service expanded the national dispatch centre (NMEDC) and opened a dedicated COVID-19 call center. The goal is to contain viral exposure by keeping suspected patients in quarantine at home and away from the public. Upon excluding medical emergency, if the call is concerning COVID-19 and fulfills either the clinical or epidemiological criteria, it is transferred to the COVID-19 call center.</p> <p>The center is manned by EMS dispatchers along with representatives from the Ministry of Health (MOH). Over 200 MDA volunteers and 50 management staff the center around the clock. Information technology staff provide around the clock support. Routinely, an average of 6,000 calls are received a day by the NMEDC. As the pandemic progressed the number of calls increased to 120,000/day.</p>
MacDonald et al. <sup>(3)</sup>	Canada	<p>Following the SARS outbreak in Toronto in March 2003 a Provincial Transfer Authorization Centre (PTAC) was set up to coordinate, control, and track all inter-facility patient transfers in Ontario as well as mitigate the risk of iatrogenic spread of SARS among facilities, workers and patients. The PTAC was co-located with the Toronto EMS Central Ambulance Communications Centre (CACC) at Toronto EMS headquarters centre in the usual way. Managers reassigned paramedic supervisors, dispatchers, and support staff to operate the centre. Staff began collating incoming transfer requests, answering telephones, and processing requests based on a decision algorithm designed to determine which transfers could be approved. A permanent centre was planned while the temporary PTAC was quickly put into operation.</p> <p>Lessons Learned: The relative success began with a thorough needs assessment with broad stakeholder representation. Input from EMS supervisory and dispatch staff was particularly valuable. Their knowledge of EMS operations changed the working group's initial proposal and assisted with implementation despite the short timelines. They also provided forecasts of daily and peak demand, which, in retrospect, were accurate. Staff with specific qualifications were selected for each role. Dispatchers were selected to dispatch ambulances or communicate with other CACCs because this was part of their regular duties.</p> <p>The PTAC was successful because it built on existing systems, while being flexible to meet the changing needs during the SARS outbreak.</p> <p>Future implementation of any EMS system change that has large-scale impact on the health care system requires simple written instructions, a better method to disseminate information in a timely manner, and increased staff to manage inquiries from end-users.</p>

**Table App 2.4 Triage and prioritisation of calls**

Triage and prioritisation of calls		
Organisation	Country	Guidance or Recommendations
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	Adjust response configurations to allow flexibility, including: Prioritisation of calls for service (for services that do not currently use priority dispatch systems) including basic algorithms for non-medically trained dispatchers or referring calls to recorded information, nurse triage hotlines, public health information lines, or other technology-based systems
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(24)</sup>	USA	As care is stratified during the COVID-19 response, more front-end triage of patient complaints should be performed to limit the burden on healthcare resources. <ul style="list-style-type: none"> <li>▪ call triage to identify patients who don't require an ambulance response when ambulance resources are depleted by overwhelming system demand</li> <li>▪ referral to Non-Emergency Resources to determine which specific call types can be transferred to a secondary triage center (e.g., nurse triage, aligned telehealth resources or advice line).</li> </ul>
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(25)</sup>	USA	Provide guidance on potential strategies for managing limited EMS resources, including: <ul style="list-style-type: none"> <li>▪ Caller screening, triage, and prioritized dispatch.</li> </ul>
International Liaison Committee on Resuscitation <sup>(11)</sup>	General	International Liaison Committee on Resuscitation consensus on science and treatment recommendations support the use of algorithms to enable the dispatcher to recognise cardiac arrest and to initiate telephone instructions for continuous chest compressions (compression-only CPR), including in the COVID-19 context.
European Emergency Number Association (EENA) <sup>(35)</sup>	Italy	<i>(Note: extensive detail of evolution of triage procedures included in document)</i> 'AREU's triage procedure is a perfect example of cooperation in emergency situations. Although it may seem to be just a simple procedure for incident qualification, the procedure is the summary of a professional and rapid response to a crisis with a very limited warning time and little time for intervention.' This list summarises the most important results achieved by the introduction of the procedure: <ul style="list-style-type: none"> <li>▪ The procedure evolved 12 times in the time span of 2 months (21 February- 23 April) and the CAD software implemented every change immediately, with the definition of the new second level PSAPs introduced during the process.</li> </ul>

		<ul style="list-style-type: none"> <li>▪ Under the procedure application, AREU established 2 toll-free PSAPs for information and 2 support PSAPs within 4 days, to manage mid-low severity incidents in place of the regular ambulance PSAPs.</li> <li>▪ The application of procedures modified the response time of 112 PSAPs during the COVID-19 crisis from 10 minutes to an average of 12 seconds waiting time. This effect was both the result of the re-direction of non-emergency calls to the toll-free number PSAPs, as well as the reorganisation of ambulance PSAPs' priorities and incident management. This was prepared by the 112 call takers carrying out call classification.</li> </ul> <p>The data analysis performed by the Business Intelligence platform and experts in AREU allowed a precise study of increased emergency calls related to breathing issues.</p>
Jaffe et al. <sup>(49)</sup>	Israel	A flow-chart was developed and programmed into the command and control system together with the infected patient routes. Patients clearly not exposed to an index case, can return to their normal routine. If exposure is confirmed, they are instructed to stay in home quarantine (for 14 days) and a paramedic contacts them to inquire about symptoms.
Bersano A., et al. <sup>(44)</sup>	Italy	In Italy, specific triage protocols were activated to assess and manage COVID-19 suspicion or infection.
Osborn et al. <sup>(12)</sup>	USA	Each request for transport of a COVID-19 or PUI patient is first screened by dispatch, then discussed with the Chief Flight Nurse and Medical Director for both safety and appropriateness. Prioritization is given to higher acuity patients requiring ventilatory support, vasopressor support, and ECMO.
Ciminelli, G. and Garcia-Mandicó, S. <sup>(45)</sup>	Italy	Our results highlight the importance of increasing preparedness, both in Italy and abroad, to help reduce mortality shall new outbreaks materialize. Governments around the world should improve pre-hospital emergency services, by clarifying the first point of contact for possible COVID-19 cases and improving phone triage to better prioritize care delivery.
Chow-in Ko et al. <sup>(1)</sup>	Taiwan	After the report of the first probable SARS case in Taipei, the city EMS organized a special system for the transport of SARS cases or patients of high risk. SARS-related transports were categorized into 1) requests from hospitals for probable/ suspect cases of SARS, 2) quarantined individuals, and 3) febrile persons. City ambulances were organized into teams A, B, and C for transport of different perceived risks and a dispatch priority for ambulance teams was put in place based on patient characteristics.
MacDonald et al. <sup>(3)</sup>	Canada	Following the SARS outbreak in Toronto in March 2003 a Provincial Transfer Authorization Centre (PTAC) was set up to coordinate, control, and track all inter-facility patient transfers in Ontario as well as mitigate the risk of iatrogenic spread of SARS among facilities, workers and patients. The PTAC was co-located with the Toronto EMS Central Ambulance Communications Centre (CACC) at Toronto EMS headquarters centre in the usual way. Managers reassigned paramedic supervisors, dispatchers, and support staff to operate the centre. Staff began collating incoming transfer requests, answering telephones, and processing requests based on a decision algorithm designed to determine which transfers could be approved. A permanent centre was planned while the temporary PTAC was quickly put into operation.

		In mid-April, work began on a web-based application to request, process, and authorize patient transfers using a decision algorithm for patient transfer services. An estimated 70% to 80% of requests can be processed using the web-based application.
MacDonald et al. <sup>(4)</sup>	Canada	A command, control, and tracking system, referred to as the Provincial Transfer Authorization Centre (PTAC), was developed and implemented to prevent the spread of SARS between hospitals. The development and implementation of PTAC, included a transfer algorithm to determine eligibility for transfer for patients who were not suspected of having SARS based on the Ministry-approved SARS screening tool. This study determined that the PTAC medical decision algorithm was highly sensitive and specific in properly authorizing interfacility patient transfers during the Toronto SARS outbreak.
Mowafi H., et al. <sup>(40)</sup>	Egypt	Implementation of a package of emergency care tools including the Integrated Interagency Triage Tool (prehospital, routine and mass casualty) and Emergency Medical and Trauma Care Checklists.

**Table App 2.5 Streamlining dispatch response**

Streamlining dispatch response		
Organisation	Country	Guidelines or Recommendations
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	<p>Recommending self-transport or referral to primary care if appropriate (may need to triage calls to medical provider to evaluate if this capability is available).</p> <p>Assignment of less than usual resources (e.g., assign law enforcement only on injury accidents unless and until clear information that non-ambulatory/critical injuries are present).</p> <p>Assignment of non-traditional resources (e.g., using `jump' cars, community paramedicine, and other responses).</p> <p>Diversion to an alternate care site.</p>
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(25)</sup>	USA	<p>Provide guidance on potential strategies for managing limited EMS resources, including:</p> <ul style="list-style-type: none"> <li>▪ caller screening, triage, and prioritized dispatch</li> <li>▪ alternative transport, no transport, and transport to alternative destinations</li> <li>▪ follow-up and leave-behind information, including telemedicine resources, for patients that are not transported.</li> </ul>
Pan American Health Organization & WHO Americas <sup>(6)</sup>	Pan American Health (Americas)	<p>Depending on resource availability, dispatch centers may coordinate the transport of unstable patients directly to an intensive care unit. Likewise, it is possible that in a well-coordinated Integrated Health Services Network (IHSN), stable patients may be transitioned to primary care rather than an inpatient setting. An IHSN that incorporates EMS and dispatch notifications will allow for the optimization of available resources and transfer of patients to the appropriate level of care.</p>
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(24)</sup>	USA	<p>As care is stratified during the COVID-19 response, more front-end triage of patient complaints should be performed to limit the burden on healthcare resources. A central dispatch or call center may activate medically approved dispatch protocols and pre-arrival instructions designed to alleviate the burden on EMS response capabilities that are being overwhelmed.</p> <p><i>Response</i></p> <ul style="list-style-type: none"> <li>▪ Modified Resource Assignments</li> <li>▪ Reduce multi-unit responses unless clearly required</li> <li>▪ Assign units irrespective of level of care (ALS, BLS, EMR)</li> </ul> <p>Adopt timely care over appropriate level of care for highest levels of triage when transport resources are severely limited.</p>
NHS England <sup>(27)</sup>	England, UK	<p>Provision of a patient transport service for suspected cases requiring testing: Ambulance services are required to implement as soon as possible an Ambulance Case Transport Response Service (CTRS) within each ambulance trust</p>

		<p>embedded in one, or adjacent to one, of their Emergency Operations Centres (EOC) to enable call receipt and dispatch. This should be scalable as demand increases.</p> <p>Each of the Ambulance CTRS will be staffed 24/7 by a manager, paramedic and control room staff. The CTRS will provide advice to ambulance crews conveying suspected or confirmed cases. The CTRS will ensure patients are conveyed in accordance with national guidance in place at the time for Public Health England input, PPE and decontamination.</p>
Pan American Health Organization & WHO Americas <sup>(6)</sup>	Pan American Health (Americas)	<p>Following identification of a PUI, assessment of illness severity should determine resource activation. Life-threatening symptoms include chest pain, difficulty breathing or altered mental status. Dispatchers should reserve ALS (advanced life support) ambulance activation for cases of severe disease. Stable patients may be transported by BLS (basic life support) providers or an alternative means of transport. If the resources are available and the regional EMS system is amenable, a dedicated infectious disease medical transport may be considered.</p> <p>Dispatch center managers should prepare a protocol for pre-arrival instructions to callers that includes turning on adequate lighting, gathering patients' medications (or list of medications) and controlling domestic animals.</p> <p>Dispatchers may recommend that family members or caller be ready to direct EMS to the location of the patient.</p>
National Health Commission of People's Republic of China <sup>(28)</sup>	China	<p>Local health authorities should push forward information technology development for emergency centers, promote information sharing and connections and improve dispatch efficiency and quality.</p> <p>Local emergency centers should intensify inquiries during dispatch events and categorize dispatches in accordance with specific situations.</p>
Chow-in Ko et al. <sup>(1)</sup>	Taiwan	<p>SARS-related transports were categorized into 1) requests from hospitals for probable/ suspect cases of SARS, 2) quarantined individuals, and 3) febrile persons. City ambulances were organized into teams A, B, and C for transport of different perceived risks and a dispatch priority for ambulance teams was put in place based on patient characteristics.</p>
Spina et al. <sup>(48)</sup>	Italy	<p>The EMS of the metropolitan area of Milan instituted a COVID-19 Response Team of dedicated and highly qualified personnel, with the ultimate goal of tackling the viral outbreak without burdening ordinary EMS activity. The team is active at all times and consists of 10 healthcare professionals supported by 2 technicians.</p> <p>On the basis of caller needs, the receiver operators of the primary PSAP dispatch calls to either the ordinary EMS for primary medical assistance or to the COVID-19 response team for the assessment of risk factors for SARS-CoV-2 infection. To address hospital needs and to receive medical directives, the COVID-19 response team maintains direct contacts with local hospitals and regional public health authorities.</p> <p>On the basis of risk factors for SARS-CoV-2 contagion and the clinical conditions of the screened individuals, the COVID-19 response team determines the need for hospital admission, home isolation, or SARS-Cov-2 testing.</p>

Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	Some additional pending measures include disconnecting the local community's first-responder system that allows citizens to be alarmed in case of suspected cardiac arrest. Because there are potential risks of contamination for those responders that do not have special equipment and the possible reduced capacity of hospital to take care of cardiac arrests cases, this application may be disconnected at some point.
Maudet et al. ( <i>Note: Document translated from French using Google Translate</i> ) <sup>(51)</sup>	Switzerland	If a shortage of healthcare resources were to set in, medical regulation (via the 144 central units) would undoubtedly have a role to play, in line with prehospital and hospital medical directives, to allocate interventions to priority cases and direct care recipients to the most appropriate structure. Depending on the circumstances, one could imagine, for example, being forced to no longer offer assistance by telephone for resuscitation or to restrict the engagement of first responders in certain types of cardiac arrest. In Geneva, a 24-hour sorting doctor was put in place at the start of the crisis, with the aim of preserving all of the canton's pre-hospital and hospital structures. It systematically assesses patients who can stay at home by videophone, and provides assistance for allocating intervention forces to priority cases and directing care recipients directly to the most appropriate structures.
Bersano A., et al. <sup>(44)</sup>	Italy	Many stroke units were closed and the usual hub-and-spoke system underwent an upheaval; all patients started to be primarily directed towards a limited number of centres where they were supposed to remain until discharge.
Zhang et al. <sup>(53)</sup>	China	To efficiently solve a quarantine vehicle scheduling problem for high-risk individual transfer, a hybrid algorithm based on the water wave optimization (WWO) metaheuristic and neighbourhood search was proposed. The metaheuristic uses a small population to rapidly explore the solution space, and the neighbourhood search uses a gradual strategy to improve the solution accuracy. Computational results demonstrate that the proposed algorithm significantly outperforms several existing algorithms and obtains high-quality solutions on real-world problem instances for high-risk individual transfer in Hangzhou, China, during the peak period of the novel coronavirus pneumonia (COVID-19).
Federal Emergency Management Agency (FEMA) <sup>(36)</sup>	USA	<i>Potential Best Practice:</i> When responding to calls pertaining to a known COVID-19 positive test, a fire department in Central Illinois first sends a "quick response vehicle" with one paramedic to assess the situation before determining that more help is needed. The paramedic is the only one who enters the home to limit those potentially exposed.



**Table App 2.6 Telemedicine**

Telemedicine		
Organisation	Country	Guidance or Recommendations
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(25)</sup>	USA	Provide guidance on potential strategies for managing limited EMS resources, including: <ul style="list-style-type: none"> <li>Utilization of telemedicine resources</li> <li>Follow-up and leave-behind information, including telemedicine resources, for patients that are not transported.</li> </ul>
Federal Emergency Management Agency (FEMA) <sup>(31)</sup>	USA	Encourage the use of telehealth and telemedicine options to consult with a physician for non-emergency health concerns, including to screen for COVID-19 symptoms.
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(5)</sup>	USA	<p>Document provides guidance for the redirection of low acuity medical complaints to alternate medical resources (e.g., Nurse Triage/Call Line, Telemedicine, Paramedic Triage) due to increase in call volume and/or decline in hospital, EMS and other resources as a result of the COVID-19 pandemic including the following considerations:</p> <p><u>Administrative</u></p> <ul style="list-style-type: none"> <li>Work with current EMD personnel and local Medical Director to identify questions to be asked and the specific criteria the caller must meet to be transferred to alternate medical resources such as Nurse Call Line or Telemedicine Triage Line</li> <li>For Triage/Call Lines not already established: ensure notification of completion of training for nurse triage and PSAP staff. Understand how referral process will work and how processes may change due to evolving circumstances</li> <li>If medical resource line is not a 24 hours/7 days a week call line, develop working schedule and communicate often between the call line side and the PSAP/Emergency Call centre (ECC) side.</li> </ul> <p><u>Technical</u></p> <ul style="list-style-type: none"> <li>Work with 911 service providers to ensure call transfer can be made while keeping the caller's call-back number</li> <li>Ensure call transfer works both ways in the event that the call needs to be transferred back to the PSAP/ECC.</li> </ul> <p>The <i>Orleans Parish Communication District (New Orleans 9-1-1)</i> pandemic protocol identifies calls that are low acuity for which an emergency department is not the best option. At that time, a paramedic initiates a video call with the patient and reviews their symptoms. In the current situation, in most cases, they are being advised to self-quarantine</p>

		<p>and not go to an emergency department. The process then places that person on a “self-quarantine registry” and someone from the staff calls the person daily to check on them. If their conditions get worse, the person is triaged again as a new patient and they may then get transported if needed.</p> <p><i>New York City – Northwell Health:</i> The Northwell Health Center for EMS, Clinical Call Center, Centralized Transfer Center, Telehealth Center and Health Solutions provide NYC 311 and FDNY EMS 911 with an emergent stand up of call center operations in order to provide telemedicine based services to callers seeking medical advice, clinical navigation or clinical care on the COVID-19 virus as well as work with the FDNY to take NYC based low and medium acuity groups of 911 callers, as possible, and cleared with Medical Director. This system of care includes a comprehensive integrated system of 911 Emergency Medical Dispatcher (AEMD) Triage, Nurse based telephonic triage, care navigation and advice, Qualified Healthcare Provider (QHP – MD, NP, PA, LCSW) telephonic/telemedicine services, QHP based telemedicine services, Community Paramedicine services, traditional EMS services and home-based Primary Care services.</p>
Maudet et al. (Note: Document translated from French using Google Translate) <sup>(51)</sup>	Switzerland	In Geneva, a 24-hour sorting doctor was put in place at the start of the crisis, with the aim of preserving all of the canton's pre-hospital and hospital structures. It systematically assesses patients who can stay at home by videophone, and provides assistance for allocating intervention forces to priority cases and directing care recipients directly to the most appropriate structures.
Riou B. The COVID-19 APHP-Universities-INRIA-INSERM Group <sup>(43)</sup>	France	To cope with the surge of calls during the COVID-19 crisis, the four EMS services involved in the study increased their response capacity by creating specific procedures for COVID-19-related calls. These included staff increase, dedicated computer stations, interactive voice server, video consultation, and sending instructions by SMS.
Magen David Adom <sup>(32)</sup>	Israel	The “green” calls (not requiring ambulance or mobile ICU) will be transferred to a secondary specialized Community Dispatch Center. These calls will use video-chat technology to initiate a consultation between the patient and a physician. The Community Dispatch Center will follow up with the patient the next day to assess their recovery.

## 'Workforce and Workplace' subtopics

**Table App 2.7 Workforce capacity**

Workforce capacity		
Organisation	Country	Guidance or Recommendations
Federal Healthcare Resilience Task Force EMS/Prehospital Team <sup>(25)</sup>	USA	Provide guidance on potential strategies for managing limited EMS resources, including modified staffing and response models.
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	Activate Contingency Staffing Plans. Start a conversation statewide about temporarily suspending telecommunicator certification/training requirements, during a state of emergency.
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	Pre-plan options for increasing staff size if necessary, by learning from experiences of other PSAPs (e.g. asking retired staff to help, asking former staff who left on good terms to come back temporarily, hiring students). Consider decreasing staffing levels when call volumes have decreased for the health of your staff with contingency plans in place to ramp staffing back up quickly when needed.
US Fire Administration (USFA) <sup>(22)</sup>	USA	Identify sources for volunteer workforce.
Pre-hospital Emergency Care Council <sup>(26)</sup>	Ireland	Pre-hospital Emergency Care Council notes that community first responder (CFR) groups are currently stood down by NAS and supports this decision pending a solution to minimise infection risk from COVID-19.
Collaborative Coalition for	Global	Consider increasing staff, also by learning from experiences of other countries (e.g. hiring students, trained volunteers, asking retired/former control room staff to come back to the PSAP).

International Public Safety <sup>(18)</sup>		
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	The EMS system must be prepared for potential staffing shortages and have plans and processes in place to mitigate these. Strategies to mitigate staffing shortages are available.
Pan-American Health Organization <sup>(13)</sup>	Pan-American	<i>(Checklist instrument developed to help countries confirm the readiness of their pre-hospital emergency medical services to respond to COVID-19, identifying immediate and priority actions aimed at responding to the emergency in an efficient and timely manner. The checklist is focused on 4 components of the pre-hospital emergency medical services.)</i> Component: 911/EMS Administration Action: Trained, sufficient, and available personnel to cover call management posts and ambulance staffing. Action: All EMS personnel trained in the Detect – Isolate – Report (D.I.R) conduct.
Federal Emergency Management Agency (FEMA) <sup>(31)</sup>	USA	Identify alternative personnel (e.g., retirees, former employees, staff from other departments) to augment call center staff and to answer non-emergency calls to free up trained staff and supervisors to answer critical 9-1-1 calls. Determine staffing levels based on call volumes. While the National Emergency Number Association (NENA) recommends that staffing should always be based on call volume, it is especially important for 9-1-1 call centers to calculate patterns in call volume during the COVID-19 outbreak and staff accordingly.
National Health Commission of People's Republic of China <sup>(28)</sup>	China	Local emergency centers should strengthen personnel training.
National Emergency Number Association (NENA) <sup>(38)</sup>	USA	Fortunately, many continuing education and certification programs have moved online, allowing PSAP staff in many centers to maintain their certifications and expand their professional qualifications despite the pandemic.
European Emergency Number Association (EENA) <sup>(35)</sup>	Italy	The supporting PSAPs were run by volunteer physicians and medics who received one-day training sessions on how to use the CAD, using the e-learning method for the first time to avoid unnecessary physical contact.

Jaffe et al. <sup>(49)</sup>	Israel	The center is manned by EMS dispatchers along with representatives from the Ministry of Health (MOH). Over 200 MDA volunteers and 50 management staff the center around the clock. IT staff provide around the clock support.
Maudet et al. <sup>(51)</sup> <i>(Note: Document translated from French using Google Translate)</i>	Switzerland	The potential absenteeism of employees is another risk identified early on during this crisis. Call management, although computer-assisted, cannot do without qualified operators who are therefore difficult to replace at short notice. Master of medicine students were integrated into the 144 GE, with the aim of leaving the triage of vital emergencies to the usual regulators (operators).
Ciminelli, G. and Garcia-Mandicó, S. <sup>(45)</sup>	Italy	Governments around the world should improve pre-hospital emergency services, by expanding capacity to manage large volumes of calls.
Semeraro et al. <sup>(47)</sup>	Italy	Following a progressive increase in calls from the province of Piacenza (belonging to Emilia Ovest area), the nearest province to the outbreak area in Lombardy, a series of emergency measures aiming to optimize the dispatch centres performances were adopted. This included increasing the number of call takers and dispatchers from 9 to 16.
Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	A second pending measure includes permitting the dispatch's medical director to downgrade the level of care (outside of protocol) from case to case when resources may be lacking including suspending telephone- CPR, downgrading some missions from ALS to BLS crews, refusing resources for inter-hospital transfers, or to take responsibility for not dispatching an emergency vehicle or allowing a patient to remain at home per the paramedics' judgment once they are on site.
MacDonald et al. <sup>(3)</sup>	Canada	An additional 50 staff were recruited, trained, and began work by 7 April, bringing the total number of PTAC staff to 80.
European Emergency Number Association (EENA) <sup>(34)</sup>	Various	<u>Increasing capacity of call centres:</u> In some departments, France has provided a brief training to students and retired people so that they can assist in the centres. In France, call takers from fire departments are also assisting in the medical services call centres in order to help manage the influx of calls. Slovenia is using senior students of the Faculty of Medicine to answer calls to the information hotline. NGOs in Malta are asking for volunteers to operate the COVID-19 helpline after complaints of callers not being able to get through to the number. In the UK, the London Ambulance Service have asked former call handlers to volunteer to work in the call centres during the COVID-19 outbreak.

**Table App 2.8 Workforce health and well-being**

<b>Workforce well-being</b>		
<b>Organisation</b>	<b>Country</b>	<b>Guidance or Recommendations</b>
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	Pre-identify strategies and resources to ensure behavioral health support for staff to mitigate adverse stress and grief and loss reactions. Develop just-in-time education for EMS personnel relative to infection prevention and control, self-care, transmission and family protection, and normal stress responses.
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	5 points on employee mental health: <ul style="list-style-type: none"> <li>▪ watch for atypical signs in behaviours and address asap</li> <li>▪ identify available Critical Incident Stress Management (CiSM) support</li> <li>▪ provide staff information regarding EAP and peer support</li> <li>▪ provide staff with info regarding community resources</li> <li>▪ direct employees to wellness portal.</li> </ul> Physical health: <ul style="list-style-type: none"> <li>▪ adopt health attestation form for essential visitors</li> <li>▪ deploy hand sanitizer at each console and in each office</li> <li>▪ implement health screenings</li> <li>▪ record temperature checks</li> <li>▪ handwashing</li> <li>▪ provide advice to employees regarding quarantine and hygiene</li> <li>▪ consider limiting employees to pick up food while on duty</li> <li>▪ identify CiSM support</li> <li>▪ track first responder/emergency responder testing sites and provide information to staff as necessary.</li> </ul> Increase cleaning approaches, ensure adequate cleaning and disinfection supplies available. Ensure supplies for extended shifts.
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	Protect your staff, for example, quarantine measures should be based on Continuity of Operations plans. Ask any personnel feeling ill to stay home. Organize regular cleaning of your PSAP.

US Fire Administration (USFA) <sup>(22)</sup>	USA	<p>Recognize that personnel have to take care of their families and plan accordingly:</p> <ul style="list-style-type: none"> <li>▪ allow appropriate personnel to take the equipment home and possibly even respond from home</li> <li>▪ encourage personnel at the operations center to communicate with their families when possible to relieve stress</li> <li>▪ encourage and expand webcam use to enable staff to keep in touch with their families.</li> </ul> <p>Vaccination of staff.</p>
Collaborative Coalition for International Public Safety <sup>(18)</sup>	Global	<p>Take into consideration the mental health and physical health needs of control room staff, e.g. stress management, peer support, exercise. (see European Emergency Number Association (EENA) post-tragedy care checklist). Organise regular disinfection of the PSAPs. If possible, control room staff should not share personal equipment, e.g. headsets. Desks, keyboards and screens should be cleaned regularly. Provide disinfecting hand gel at all entry/exit points, as well as warning notices. Communication is key – communicate well with employees regarding any new measures and the support available.</p>
Pan American Health Organization & WHO Americas <sup>(6)</sup>	Americas	<p>Managers should ensure that personnel take respective rest periods and that they have designated spaces for food and rest. Personnel should try to maintain correct posture and take frequent muscle stretching breaks (active pauses). Dispatchers need to keep their workstations clean, wiping surfaces (e.g. desks and tables) and objects (e.g. telephones, keyboards) with disinfectant before and after their shift or at all staff changes for shared dispatch consoles). If available, personnel may consider the use of a personal keyboard, mouse and headset and store them in a private and clean space. Dispatchers should follow the hand-washing and respiratory hygiene procedures established by their agencies, avoid sharing cups, plates or other personal items in the rest areas, and clean all surfaces that are touched frequently.</p>
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	<p>Screen all EMS Personnel for Signs or Symptoms of SARS-CoV-2 Infection at the Start of Each Shift</p> <ul style="list-style-type: none"> <li>▪ Although screening for symptoms will not identify asymptomatic or pre-symptomatic individuals with SARS-CoV-2 infection, symptom screening remains an important strategy to identify those who could have COVID-19 and require prompt assessment and response.</li> <li>▪ Screen all EMS personnel and visitors (i.e., anyone entering the facility) for symptoms consistent with COVID-19 and exposure to others with SARS-CoV-2 infection. Screen EMS personnel at the start of each shift. Screen visitors prior to entry to the facility (e.g., firehouse or EMS station).</li> <li>▪ Actively take their temperature and confirm absence of symptoms consistent with COVID-19. Fever is either measured temperature <math>\geq 100.0^{\circ}\text{F}</math> or subjective fever.</li> <li>▪ Ask them if they have been advised to self-quarantine because of exposure to someone with SARS-CoV-2 infection.</li> <li>▪ Promptly manage anyone with symptoms of COVID-19 or who has been advised to self-quarantine:</li> </ul>

		<ul style="list-style-type: none"> <li>EMS personnel should don a facemask if not already wearing one, return home, and notify occupational health services to arrange for further evaluation.</li> </ul> <p>Visitors should be restricted from entering the facility.</p>
Lee J., et al <sup>(20)</sup>	USA	<p><b>** Note: Unclear if this document is only relevant to physical patient contact setting**</b></p> <p>Peer-support teams should take a proactive approach to supporting health and well-being of staff.</p> <p>Contact each frontline employee, especially the ones too busy to reach out, to develop a wellness plan. The plan can be formal or informal but should include information and skills for each provider across several different areas. The message should be the same: Personnel need to become intentional about self-care.</p> <p>Encourage EMS personnel to create structure at home to help create certainty and normalise the home. The schedule should include time to continue regular exercise or activity and stay connected with friends and family. Scheduling can also include limiting news coverage to a few trusted sources and scheduling times throughout the day for accessing information. Keep an open dialogue with nonmedical family members re COVID-19 and take cues from family re how much to discuss.</p> <p>Form agreements at work about time spent talking about COVID. Constant talk of worst-case scenarios is not helpful to your health and well-being. Don't be afraid to invite people to have different discussions or change the subject.</p> <p>Regardless of their experience, all EMS providers have faced stressful calls and developed their own methods for dealing with stress. One framework that "has been shown to decrease stress-related work symptoms" is the 'problem-solving approach'. This approach is based on the following steps:</p> <ol style="list-style-type: none"> <li>1. Define the problem and goal</li> <li>2. List possible solutions</li> <li>3. Identify consequences with each solution</li> <li>4. Develop an action plan by prioritizing the solution list</li> </ol> <p>The authors also suggest that staff learn skills such as visualisation, breath control and attention focus to manage stress while on calls.</p> <p>The scale of the COVID-19 outbreak has forced decisions surrounding allocation of resources and triage in a way rarely seen in modern medicine. This may force EMS and other healthcare providers to make decisions that conflict with their morals or ethics. These situations are referred to as moral injuries. Addressing this potential should be part of a proactive approach by peer support teams. Open and honest discussions about possible situations may help, including open lines of communications with supervisors and medical oversight so expectations can be established.</p>
National Emergency Number Association (NENA) <sup>(37)</sup>	USA	<p>Nearly three-quarters of respondents indicated their PSAP has taken measures to address employee wellness and stress during COVID-19. Narrative responses indicate a diverse range of wellness measures (e.g. counselling, peer support, EAP, relaxed dress codes, counselling, providing meals.)</p>



**Table App 2.9 Physical distancing or remote working**

<b>Physical distancing or remote working</b>		
<b>Organisation</b>	<b>Country</b>	<b>Guidance or Recommendations</b>
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	<p>Limit Emergency Communications Center (ECC) access to employees and essential traffic.</p> <p>If possible separate telecommunicators to allow 6 ft. between them.</p> <p>Stop physical console changes during shift – instead, this can be done virtually.</p> <p>Limit training rooms and conference rooms to only ECC personnel.</p> <p>Avoid in-person meetings/role calls unless essential – instead, use other methods such as webinars/Zoom/ Skype/ GoToMeeting.</p> <p>Suspend work-related travel.</p> <p>Suspend employee personal travel and/or institute self-isolation guidelines upon return.</p>
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	<p>Ask administrative staff to work from home.</p> <p>Optimize ergonomics and shifts of your PSAP – practicing staff distance.</p> <p>Preplan remote call-taking/dispatching from home if your technology allows it.</p>
US Fire Administration (USFA) <sup>(22)</sup>	USA	<p>Define who is eligible to work from home.</p> <p>911 dispatcher/call center manager recovering from virus or staying at home as caretakers.</p> <p>If possible, work toward an all-911 dispatch home-based workforce to reduce exposure.</p>
Collaborative Coalition for International Public Safety <sup>(18)</sup>	Global	<p>Ask administrative staff to work from home.</p> <p>Introduce quarantine measures.</p> <p>Optimise ergonomics and shifts of PSAPs. For instance, you may divide the pool of control room staff into several small clusters.</p> <p>Organise call-taking from home if your technology allows it.</p> <p>Do not permit entry to the PSAPs by any unnecessary visitors.</p> <p>If possible, arrange control room staff at consoles to maintain appropriate distancing.</p>
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	<p>For EMS personnel, the potential for exposure to SARS-CoV-2 is not limited to direct patient care interactions. Transmission can also occur through unprotected exposures to asymptomatic or pre-symptomatic co-workers in breakrooms, co-workers or visitors in other common areas, or other exposures in the community. Examples of how physical distancing can be implemented for EMS personnel include:</p> <ul style="list-style-type: none"> <li>▪ Reminding EMS personnel that the potential for exposure to SARS-CoV-2 is not limited to direct patient care interactions.</li> </ul>

		<ul style="list-style-type: none"> <li>▪ Emphasizing the importance of source control and physical distancing when engaged in non-patient care activities.</li> <li>▪ Designating areas for EMS personnel to take breaks, eat, and drink that allow them to remain at least 6 ft. apart from each other, especially when they must be unmasked.</li> </ul>
National Emergency Number Association (NENA) <sup>(37)</sup>	USA	<p>64% of respondents reported that their PSAP had no capability for remote PSAP operations. Only 30% reported they can work remotely from a separate public-safety or government facility, and only 7% indicated the ability to do so from home. (NENA recommends remote working).</p> <p>PSAPs have taken measures including:  Ordering technical and administrative staff to work from home as much as possible, arranging telecommunicators at consoles in a manner that maintains appropriate distancing, assigning telecommunicators to work at a single designated console across shifts (in some cases temporarily moving consoles to separate rooms in the building), taking employees' temperatures at the start of shifts, installing UV disinfectant systems inside HVAC systems, and prohibiting any non-dispatch personnel from accessing the PSAP floor.</p>
National Emergency Number Association (NENA) <sup>(38)</sup>	USA	A few PSAPs have reported accelerated rollouts of remote call handling and dispatch operations, given the increased need for physical distancing during COVID-19.
Maudet et al. <sup>(51)</sup> <i>(Note: Document translated from French using Google Translate)</i>	Switzerland	<p>The 144 VD-NE control unit restricted its access to regulators (operators) and supervisors only, as a first protective measure.</p> <p>An increase in remote working capacities has also been carried out, to anticipate possible home quarantines or the closing of borders.</p>
Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	It was initially decided to "sanctify" the dispatch and strictly limit its access to dispatchers and supervisors only. Remote dispatch desks in private homes have been set up and in order to allow regulators (operators) suspected or confirmed of COVID-19 infection but still in good health to be able to continue working on a voluntary basis.
Notruf Niederosterreich <sup>(33)</sup>	Austria	<p>Staff assigned to clusters and never meet those outside their own cluster.</p> <p>Working from home mandatory during pandemic, although has been in operation since 2017.</p> <p>Data show the following numbers working from home during the pandemic: 105/160 call takers; 22/28 back office personnel; and 15/15 technicians.</p>

## 'Governance and Planning' subtopics

**Table App 2.10 Resilience**

Resilience		
Organisation	Country	Guidance or Recommendations
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	Test all backup equipment and sites. Activate disaster security protocols for primary and backup sites.
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	Pre-plan procedures in how to respond if the need to close your PSAP to clean/disinfect arises. Make sure to dedicate some time to adapting and readapting to the situation, but make sure that decisions are clearly communicated to citizens and employees. This may require avoiding too many changes of plans and trying to put in place stable measures as early as possible. This is where learning from other affected areas can be very useful.
Collaborative Coalition for International Public Safety <sup>(18)</sup>	Global	Plan how to react if there is a COVID-19 case among your personnel. Prepare contingency plan for if PSAP has to close (see separate European Emergency Number Association (EENA) guidance on Continuity of Operations Response). Consider cybersecurity as essential. Cybersecurity measures should be strengthened as cyberattacks against public authorities and critical services are increasing in the current context of COVID-19 (see separate EENA guidance on cybersecurity).
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	The EMS system must be prepared for potential staffing shortages and have plans and processes in place to mitigate these, including providing resources to assist EMS personnel with anxiety and stress.
National Emergency Number Association (NENA) <sup>(37)</sup>	USA	Recommends remote working in order to improve resiliency for future pandemic or other crises. While it is reasonable for PSAPs to restrict any and all non-essential activities at this time, especially any engagement with their vendors, NENA warns that foregoing installation of vendor upgrades could expose PSAPs to vulnerabilities if the upgrades include security enhancements.
National Emergency Number Association (NENA) <sup>(38)</sup>	USA	PSAPs have turned their attention to backup sites: prioritizing upgrades, maintenance, and general readiness with the expectation that, if a staff member tests positive for COVID-19, the primary site will need to be shut down temporarily for cleaning and disinfection. That said, PSAPs with a full-scale backup center represent only a small

		portion of all PSAPs in the US, and while backup PSAPs are recommended, the reality is that they remain a luxury for many jurisdictions.
Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	As a consequence of the large number of dispatchers living on the French side of Lake Geneva (opposite Lausanne), dispatch desks have also been set in operation in France in order to anticipate a possible total closure of the borders.
Ciminelli, G. and Garcia-Mandicó, S. <sup>(45)</sup>	Italy	Our results highlight the importance of increasing preparedness, both in Italy and abroad, to help reduce mortality shall new outbreaks materialize. Governments around the world should improve pre-hospital emergency services, by clarifying the first point of contact for possible COVID-19 cases and improving phone triage to better prioritize care delivery.

**Table App 2.11 Monitoring (COVID-19 or operations)**

<b>Monitoring (COVID-19 or operations)</b>		
<b>Organisation</b>	<b>Country</b>	<b>Guidance or Recommendations</b>
Assistant Secretary for Preparedness and Response, Department of Health and Human Services <sup>(15)</sup>	USA	Evaluate available indicators for planning (e.g. number of potential cases, staff illness). Evaluate indicators that have effects on EMS (e.g. availability of staff).
Federal Healthcare Resilience Task Force EMS/Prehospital Team(5)	USA	Implement a mechanism for collecting and aggregating data, such as, number of calls (categorised by incident type, by Emergency Medical Dispatch (EMD) codes, etc.) for program evaluation and decision. Establish a mechanism for collecting/reporting data on calls received exclusively seeking information. Utilize that data to develop public service announcements and post the response to FAQs on appropriate websites.
National Emergency Number Association (NENA)(14)	USA	Monitor staff physical and mental health.
Ministry of Health <sup>(29)</sup>	India	Both call centre and ambulances should always keep an updated list of available hospitals and beds.
Faculty of the Resuscitation Academy <sup>(16)</sup>	USA	Information to collect during the COVID-19 pandemic include: <ul style="list-style-type: none"> <li>○ Number and types of calls including suspected COVID-19 cases (<i>other points also mentioned, e.g. PPE</i>)</li> </ul> <p>Not only does excellent communication and documentation drive EMS actions in the field, computer-aided dispatch (CAD) data provides insightful information for overall system surveillance. Working as a team, communication centers and EMS providers can make a significant impact in reducing the spread of COVID-19.</p>
Collaborative Coalition for International Public Safety(18)	Global	Observe what is being done in other countries, especially those most affected. Keep good coordination between all the different public safety organisations (e.g. overflow of calls, availability of beds, and availability of patient transportation means).

National Health Commission (NHC) of People's Republic of China(28)	China	The NHC will establish a pre-hospital emergency information reporting mechanism, strengthen information management and enhance monitoring and early warning systems.
Pan-American Health Organization <sup>(13)</sup>	(Pan-American)	<p><i>(Checklist instrument developed to help countries confirm the readiness of their pre-hospital emergency medical services to respond to COVID-19, identifying immediate and priority actions aimed at responding to the emergency in an efficient and timely manner. The checklist is focused on 4 components of the pre-hospital emergency medical services.)</i></p> <p>The items on the Readiness checklist are designed for dichotomous confirmation, i.e., whether or not they have been met or achieved. If the activities have been initiated but have not yet been implemented and tested, they should be noted as "in process". This makes it possible to monitor each activity.</p> <p>The readiness process must be constantly monitored, so that appropriate corrective measures or decisions can be taken.</p> <p>Checklist components:</p> <ul style="list-style-type: none"> <li>○ Access to a single number for emergency and call dispatch services</li> <li>○ First responders</li> <li>○ Transfer of patients to a referral center, including BLS and ALS.</li> <li>○ Administration (including medical direction, human resources, and training)</li> </ul>
Federal Emergency Management Agency (FEMA)(31)	USA	It is especially important for 9-1-1 call centers to calculate patterns in call volume during the COVID-19 outbreak and staff accordingly.
Spina et al. <sup>(48)</sup>	Italy	The algorithm developed by Milan's Emergency Medical System for the detection of suspected cases of COVID-19 is constantly updated to meet regional directives about hot zone extension and modalities for SARS-CoV-2 testing.
Sechi et al. <sup>(46)</sup>	Italy	The Regional Emergency Medical Services (EMS) Trust (AREU) of the Lombardy region decided to apply Business Intelligence (BI) to the management of EMS during the epidemic. Since the beginning of the COVID-19 outbreak, AREU is using BI daily to track the number of first aid requests received from 112. BI analyses the number of requests that have been classified as respiratory and/or infectious episodes during the telephone dispatch interview. Moreover, BI allows identifying the numerical trend of episodes in each municipality (increasing, stable, and decreasing). AREU then reallocates the resources based on real-time data recorded and elaborated by BI. Based on that data, vehicles and personnel have been implemented in the municipalities that registered more episodes and where the clusters are supposed to be. BI has been of paramount importance in taking timely decisions on the management of EMS during COVID-19 outbreak.

Murphy et al. <sup>(52)</sup>	US	<p>Scout Program classification:</p> <p>Case review indicated that initial symptom often derived from dispatch reporting did not adequately characterize illness and the potential for COVID-19 illness. In response, EMS was using large quantities of PPE to address this uncertainty, though the prevalence of confirmed COVID-19 EMS encounters was estimated to be less than 5%. Hence, EMS leadership implemented a "scout program" beginning 14 March in which 1 or 2 EMS providers donned full PPE and entered the "hot zone" to perform the initial in-person evaluation while additional crew remained in the "cold zone," maintaining sight or voice contact, with scout responder(s). The scout evaluation informed the need for remaining EMS crew to don PPE to assist.</p> <p>Iterative dispatch and operational EMS responses to COVID-19 risk identification and PPE use were associated with both a temporal decrease in EMS provider COVID-19 exposure and conservation of PPE.</p>
MacDonald et al. <sup>(3)</sup>	Canada	<p><i>(Following the SARS outbreak in Toronto in March 2003 a Provincial Transfer Authorization Centre (PTAC) was set up to coordinate, control, and track all inter-facility patient transfers in Ontario as well as mitigate the risk of iatrogenic spread of SARS among facilities, workers and patients)</i></p> <p>In addition to risk mitigation, this type of centre could provide syndromic surveillance in real time and provide the earliest indication of a potential threat to public health in acute and long-term care facilities.</p>
Riou B. The COVID-19 AHP-Universities-INRIA-INSERM Group <sup>(43)</sup>	France	<p>Since 20 January all calls and patient records related to COVID-19 were identified in their information system and a daily automated activity report was produced.</p> <p>The daily number of COVID-19-related telephone calls received by the EMS and corresponding ambulance dispatch, and the proportion of positive RT-PCR were the earliest indicators of the number of COVID19 patients requiring ICU care during the epidemic crisis in the Ile-de-France region, rapidly followed by ED and GP visits. This information may help health authorities in future planning and monitoring.</p>
Mowafi H., et al <sup>(40)</sup>	Egypt	<p>Establishing robust emergency care data collection through the International Registry of Trauma and Emergency Care, and linking to other existing public health information systems, can strengthen emergency surveillance systems. In addition, it can serve as a bridge between public health emergency response and ongoing quality and performance improvement of national emergency care systems.</p>

**Table App 2.12 Information governance, protocols and procedures**

<b>Information governance, protocols, procedures</b>		
<b>Organisation</b>	<b>Country</b>	<b>Guidance or Recommendations</b>
Assistant Secretary for Preparedness and Response, Department of Health and Human Services (15)	USA	Refers to information sharing within and among agencies and awareness of changes in local policies re EMS operations during COVID-19.
Federal Healthcare Resilience Task Force EMS/Prehospital Team(25)	USA	Potential need for waiver/suspension of EMS laws and regulations relating to areas such as Public Safety Answer Point(s) Operations, medical oversight, protocol adherence ( <i>9 areas listed in total</i> )
Federal Healthcare Resilience Task Force EMS/Prehospital Team(5)	USA	Procedures for handling incoming calls for COVID-19 information and Low Acuity Medical Complaints may need to be revised. May require administrative, technical and operational protocols, policies and procedures to be modified. (Document provides guidance and considerations for these modifications)
National Emergency Number Association (NENA) <sup>(14)</sup>	USA	Review COOPs (Continuity of Operations)/Contingency Plans and make situational adjustments as needed to include decontamination of the PSAP if it becomes necessary. Make changes to policy/procedure/protocols as needed – policy/procedure changes may come from responder partners and protocol changes may come from the dispatch protocol vendor. Assign someone to monitor the protocol vendor website to keep up with changes. Review all internal and external resource contact numbers to make sure they are current (e.g., response partners, public support agencies).
National Emergency Number Association (NENA) <sup>(17)</sup>	USA	Verify emergency call overflow procedures are accurate and up to date among designated Public Safety Answering Points (PSAPs). In PSAPs at the early stages of the outbreak: Consider updating your PSAP call taking and dispatching protocols as appropriate to filter and divert nonemergency Covid-19 related calls sooner and ensure updated EMD protocols are available to deal with acute-cases.



US Fire Administration (USFA) <sup>(22)</sup>	USA	Review operation plans for call centers and information lines. Review 911 pandemic protocols from government and national professional organizations
Pan American Health Organization & WHO Americas <sup>(6)</sup>	Pan American Health (Americas)	Identification of a PUI: Dispatch managers should keep screening algorithms up to date according to latest WHO PUI definition. Dispatchers should be aware of any changes to the algorithm or screening protocol.
Centers for Disease Control and Prevention <sup>(7)</sup>	USA	PSAP/Emergency Communications Centers should utilize medical dispatch protocols that are approved by their EMS medical director in consultation with the local or state public health department. These protocols should be updated, as needed, to accommodate changes in EMS availability, and/or the redirection of low acuity calls to alternate disposition (e.g., nurse triage line, telemedicine triage line).  EMS should have a process for notifying the health department about suspected or confirmed cases of SARS-CoV-2 infection, and should establish a plan, in consultation with local public health authorities, for how exposures in EMS personnel will be investigated and managed and how contact tracing will be performed. The plan should address the following: <ul style="list-style-type: none"> <li>▪ Who is responsible for identifying contacts (e.g., EMS personnel, patients, and family members) and notifying potentially exposed individuals?</li> <li>▪ How will such notifications occur?</li> <li>▪ What actions and follow-up are recommended for those who were exposed?</li> </ul>
National Health Commission of People's Republic of China <sup>(28)</sup>	China	Local health authorities should push forward information technology development for emergency centers, promote information sharing and connections and improve dispatch efficiency and quality.
Pan-American Health Organization <sup>(13)</sup>	(Pan-American)	Checklist instrument developed to help countries confirm the readiness of their pre-hospital emergency medical services to respond to COVID-19 with respect to the development, validation and implementation of procedures and protocols for various activities.  Checklist component: Call Management Action: The call protocol has an up-to-date questionnaire that includes COVID-19 symptoms and risk factors for (e.g., history of travel to affected areas), based on case definition. Action: Availability of a technological platform for correct classification of alerts, call management, and information management.  Checklist component: First Responders Action: Identified and established protocol/procedure for communication with 911 and emergency medical dispatch centers and/or EMS in order to inform emergency medical personnel of a possible case of COVID-19.

		<p>Checklist component: 911/EMS Administration</p> <p>Action: Protocol developed, implemented, and tested for risk exposure assessment and management of professionals exposed to COVID-19.</p> <p>Action: Protocol developed and implemented for medical leave for quarantined emergency personnel.</p> <p>Action: Periodic updating and maintenance of all EMS procedures for COVID-19 response.</p> <p>Action: Official spokesperson designated and coordinated with health authorities</p>
Federal Emergency Management Agency (FEMA) <sup>(36)</sup>	USA	<p><i>Potential Best Practice:</i> EMS departments in the greater Richmond, Virginia area participate in conference calls 6 times per week to share information, respond to concerns, and stay connected with each other. The International City/County Management Association (ICMA) suggests including state and local public health organizations and PSAPs in these calls.</p> <p><i>Potential Best Practice:</i> The Illinois State Fire Marshall office recommended that EMS medical directors provide appropriate oversight for each PSAP (including 911 call centers, EMS systems, healthcare facilities, and public health organizations) as they coordinate the COVID-19 response.</p> <p><i>Potential Best Practice:</i> The New York Department of Health encouraged local emergency managers, EMS coordinators, and local health departments to develop their own coordination policies, including methods for first responders to contact emergency management officials and health departments when encountering COVID-19 patients after-hours, on weekends, and during holidays.</p>
Dami, F. and Berthoz, V. <sup>(50)</sup>	Switzerland	Lesson learned: Maintain protocols for downgrading your response (to manage the provision of a less than usual response, where resources are lacking)
Notruf Niederosterreich(33)	Austria	Advanced Medical Priority Dispatch System (AMPDS) Protocol 36 adopted.
MacDonald et al. <sup>(3)</sup>	Canada	<i>(Regarding an emergency medical services transfer authorization centre)</i> Paramedic supervisors, dispatchers, and support staff developed process flow details on an ad-hoc basis, in real time, in the first few hours after the centre was operational. The details underwent continual refinement and were finalized during the first 8 to 12 hours.

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**Published by the Health Information and Quality Authority (HIQA).**

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