Delphi study into planning for care of children in major incidents

Simon D Carley, Kevin Mackway-Jones, Stuart Donnan

Abstract
This paper describes a Delphi study used to identify and improve areas of concern in the planning of care for children in major incidents. The Delphi was conducted over three rounds and used a multidisciplinary panel of 22 experts. Experts were selected to include major incident, immediate care, emergency medicine, and paediatric specialists. This paper presents a series of consensus statements that represent the Delphi group’s opinion on the management of children in major incidents. The statements cover all phases of major incident planning and response. Paediatric services may play a vital role in the preparation and response to a major incident involving children. This paper represents a consensus view on how best to plan and respond to major incidents involving children. An accompanying paper describes the practical implementation of this guidance.

Keywords: major incident; Delphi study; panel of experts; emergency medicine

Major incidents—a definition:
“An event that owing to the number, severity, type or location of live casualties requires special arrangements by the health services.”

Major incidents known to have involved large numbers of children

<table>
<thead>
<tr>
<th>Major incident</th>
<th>Year</th>
<th>All casualties (n)</th>
<th>Child casualties (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martinez coach crash (USA)</td>
<td>1975</td>
<td>51</td>
<td>50</td>
</tr>
<tr>
<td>Mass lightning strike (USA)</td>
<td>1977</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>Bologna bombing (Italy)</td>
<td>1980</td>
<td>291</td>
<td>27</td>
</tr>
<tr>
<td>M5 coach crash (UK)</td>
<td>1983</td>
<td>31</td>
<td>27</td>
</tr>
<tr>
<td>Chemical gas leak, Arizona</td>
<td>1987</td>
<td>&gt;67</td>
<td>67</td>
</tr>
<tr>
<td>Enniskillen bombing (ND)</td>
<td>1987</td>
<td>65</td>
<td>6</td>
</tr>
<tr>
<td>Three rivers regatta accident (USA)</td>
<td>1990</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Newton train crash (UK)*</td>
<td>1991</td>
<td>26</td>
<td>7</td>
</tr>
<tr>
<td>Avianca plane disaster (USA)</td>
<td>1993</td>
<td>92</td>
<td>22</td>
</tr>
<tr>
<td>York coach crash (UK)†</td>
<td>1994</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>West St bus crash, Glasgow (UK)†</td>
<td>1994</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Abbeyhill junction train crash (UK)*</td>
<td>1994</td>
<td>47</td>
<td>10</td>
</tr>
<tr>
<td>Oklahoma bombing (USA)</td>
<td>1995</td>
<td>759</td>
<td>61</td>
</tr>
<tr>
<td>Warrington coach crash (UK)†</td>
<td>1996</td>
<td>51</td>
<td>50</td>
</tr>
<tr>
<td>Manchester bombing (UK)*†</td>
<td>1996</td>
<td>217</td>
<td>30</td>
</tr>
<tr>
<td>Dunblane mass shooting (UK)*</td>
<td>1996</td>
<td>30</td>
<td>28</td>
</tr>
</tbody>
</table>

The incidents listed are those for which casualty numbers are available. Many other incidents have involved children but the exact numbers are unknown (for example, Zeebruge ferry disaster and the Hillsborough stadium disaster)

*Personal communication, Health and Safety Executive, 1996.
†Personal communication, Merseyside Ambulance Service, 1996.
NI, Northern Ireland.

If casualties in major incidents are to receive the best possible care then quality planning and preparation is essential. The prospect of dealing with a major incident that results in large numbers of injured children is daunting. Nevertheless, such incidents do occur both in the UK and abroad (Table 1). Although major incidents can arise from a variety of causes, children may be prominent in many types of major incident (Table 1). Those providing paediatric services may feel that major incident planning is an area in which they have a small role to play. In fact, they can play a vital role in the preparation and response to a major incident involving children.

Difficulties in the management of children during a major incident have been documented at all stages of the incident response. In the prehospital phase, problems have been identified in determining triage and transport priorities. In the hospital reception phase, difficulties have arisen in mobilising staff experienced in managing children, and in obtaining adequate amounts of paediatric equipment. In the surgical phase of a major incident, concern has been expressed at the standard and choice of surgical procedures performed by non-paediatric surgeons. The common theme is not that planning for children failed, but rather that planning for children did not exist.

Major incident planning should follow an “all hazards approach” that is designed to deal with all types of major incident. Certain types of incident require additional arrangements if optimal patient care is to be achieved. Incidents resulting in chemical, burn, or radiation casualties require additional arrangements, primarily because the resources to deal with these types of patients are scarce and often located in regional centres, at least in the UK. An incident resulting in only a few such casualties may result in the declaration or even decompensation of a major incident.

Few UK hospitals are staffed or equipped to deal with more than a few seriously injured children, with well documented shortages of paediatric surgical and intensive care unit beds. Specialist services for children are geographically scattered and some are confined to specialist hospitals not always co-located with emergency departments. This distribution...
might make it difficult to provide specialist care during a major incident.

The need for paediatric major incident planning is recognised in many countries, but few centres in the UK recognise it as a priority. Recent analysis of hospital major incident plans has shown that fewer than one third of hospitals plan for the care of children in major incidents, and that prehospital teams rarely contain staff trained in paediatrics.

We conducted a three part Delphi study with the aim of identifying and improving areas of concern in planning for major incidents involving children.

Methods

A three round Delphi was conducted between February 1996 and October 1996 using a panel of 22 experts from specialties involved in the management of children in major incidents (appendix 1).

Expertise was ascribed using two criteria: first, evidence of research activity in major incidents or paediatric/prehospital emergency care; second, if individuals held positions of authority and influence within the sphere of major incident planning. This was to ensure that decisions were made by persons in senior posts, so that subsequent implementation and recommendations would be eased. There was considerable overlap between these two groups. A list of the members of the Delphi group is given at the end of the paper. Twenty eight individuals were approached, of whom 22 agreed to participate and completed the second round; 18 individuals completed all rounds.

The first round of the Delphi asked group members to consider broadly the problems of dealing with children in major incidents. Their replies were collated into a series of statements that were checked for clarity by an independent person.

Round 2 comprised 161 statements. Group members were required to express their level of agreement with each statement using a Likert scale.

The third and final round of the Delphi presented the same statements together with a summary of the rest of the group’s findings (table 2).

In the third round group members could change their opinions after considering the opinions of the rest of the group.

Consensus was defined as: (1) all members of the group agreeing with the statement; (2) all but one member of the group agreeing with the statement; or (3) two members scoring 4 with the rest of the group in agreement (for a positive statement). Statements that achieved consensus in the second round were not reiterated in round 3.

Eight of 161 (5%) statements in round 2 were left unanswered by more than half of the group because of ambiguous terminology. These statements were rewritten and submitted without feedback in round 3. Fourteen additional statements were constructed for

### Table 2  Example of Delphi statement in round 3

(13) The regional emergency planning officers (REPO) should ensure that provision is made for the care of children in major incidents

<table>
<thead>
<tr>
<th>Likert scale*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results from round 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

*A Likert scale is a simple numerical scale that allows a subjective view (that is, level of agreement in this study) to be converted into a numerical value. Conversion to a numerical value allows the results to be analysed statistically.

### Table 3  Statements reaching consensus on major incident preparation

**Preparation**

1. It is important to consider the special needs of children involved in a major incident
2. Paediatric services will be relatively more stressed by an incident involving children than adult services in a similar size or type of incident
3. Planning for children should be coordinated at a regional level
4. Planning may be aided by estimating the capacity of local hospitals to receive minor and seriously injured paediatric casualties
5. A mechanism for disseminating information on major incidents is required
6. Where possible, children should be cared for in paediatric facilities
7. Planning should be coordinated by a clinician experienced in the management of trauma in children
8. Plans for children should be an integral part of all plans

**Equipment**

1. The provision of paediatric equipment is an important part of emergency planning
2. Approximately 10–15% of major incident equipment should be suitable for use in children
3. Equipment should be available and appropriate for use in children
4. Equipment checklists may aid emergency planners in preparing for the prehospital and hospital response
5. Equipment supply to hospitals from suppliers is increasingly on a “just in time” basis, this may result in difficulties in obtaining equipment re-supply in major incidents
6. Some areas designate a single adult department as the main receiving hospital for major incidents, such hospitals must be adequately equipped to deal with children in these circumstances

**Training**

1. Individual preparation for major incidents should include training in the management of injured children and adults
2. Staff likely to be part of mobile medical teams should be encouraged to train in adult and child resuscitation and major incident management
3. Individuals required to take on key roles in a major incident response should receive training in major incident management
4. Major incident planners should use exercises to test the management of paediatric casualties in their area
5. When testing major incident plans, children should be played by children aged 7–14. Adequate provision must be made for their care and safety
6. For training to be effective, key personnel must be made aware of their major incident roles

### Table 4  Statements reaching consensus on major incident management

1. In the prehospital phase of a major incident children should follow the same routes and be treated in the same areas as adults
2. Problems may arise when parents/relatives are present at the scene. The decision as to whether or not to allow parents to remain with children at the scene is dependent on local circumstances. This decision should be made by the senior medical and ambulance officers at the scene
3. Difficulties may arise in the command of the scene when both children and adults are involved in a major incident
Clinical experimentation is impossible so, traditionally, practice has been based upon a small number of case reports and expert opinion. The opinions of single authors are highly susceptible to bias. This is particularly so with regard to major incident planning because we believe a multidisciplinary approach is necessary. Committees and expert working groups are also susceptible to bias through confounding by interpersonal relationships. We used the Delphi method in an attempt to reduce bias. The process produced a series of statements on which a panel of experts has achieved consensus. These cover prehospital and hospital phases of planning and response to a major incident involving children. It became clear that the difficulties of managing children should be considered when planning for major incidents, so that both clinical expertise and equipment resources will be available. This may require cooperative planning arrangements between hospitals. Such arrangements must be made in advance of a major incident because they are difficult to coordinate successfully when an incident is in progress.

Many of the consensus statements extrapolate on the principles relevant to adult major incident planning (for example, the provision of suitable equipment). However, the provision of specialist services proved a particular consideration. Tertiary services (in particular intensive care and surgery) may be at a premium during a major incident. It would be impractical to transfer all children to specialist centres for assessment and treatment because this would merely result in transferring a major incident from one hospital to another. Clearly, a form of triage is required to identify those children most likely to benefit from tertiary services. The use of a paediatric assessment team (PAT) has been proposed as a solution to this problem. This concept is not new, having been proposed for chemical, burns, and radiation incidents. These specialist PATs only form during the response to a major incident. However, they are similar to paediatric intensive care retrieval teams, consisting of senior, skilled staff experienced in travelling to and working in other hospitals. It is quite likely that the services of an intensive care retrieval team would be required in a major incident involving children, and we suggest that this role be formalised with the addition of a paediatric surgical opinion. Membership will depend upon local resources but should be made explicit in local and regional major incident plans.

So far as we know, this is the first time that a systematic approach to expert opinion has been
taken in this field of research. However, our findings must be interpreted with some caution for the following reasons.

First, the definition of expertise is subjective and relies upon the leading researcher and advisors knowing who are the potential experts in the field. We attempted to seek representation from all specialities with an interest in major incident planning for children, based upon our own knowledge, and recognise this as a source of bias. Second, the Delphi method only explores those areas of concern raised by members of the group, so important areas of planning might have been overlooked. Third, although the group appears to have achieved consensus on many statements this does not necessarily mean agreement. Delphi group members who are tired or bored with the process might shift towards consensus to stop the process.

This Delphi study did not produce a succinct set of guidelines for use by emergency planners. Our accompanying paper illustrates how the principles outlined in this paper can be translated into practice.

Appendix 1: The Delphi process

Delphi is a structured process that uses a panel of experts to investigate a complex or imprecise issue using a series of structured statements. It was originally designed for use by futurologists at the RAND Corporation during the 1960s. It has since been used in many other areas, most recently in the health care sciences. The process occurs in three stages:

Stage 1. A panel of experts formulate a series of ideas pertaining to the subject in question. This is done individually and anonymously.

Stage 2. The statements from stage 1 are collated and sent to all members of the expert group. They indicate their level of agreement with each statement using a Likert scale (table 2).

Stage 3. Each statement is fed back to the panel with their own and the rest of the panel’s previous opinions. All feedback is anonymous. Numerous iterations may be necessary.

SPECIALITIES REPRESENTED IN THE DELPHI GROUP

Hospital paediatrics
Paediatric emergency medicine
The Ambulance Service
The Department of Health (emergency planning)
Immediate (prehospital) care doctors and nurses
Paediatric anaesthetics
Emergency nursing
Disaster planning
Accident and emergency

Delphi group members

David Larkin (Ambulance Service Association), Alan Parker (Ambulance Service Association), Andrew Marsden (Scottish Ambulance Service), Chris Carney (Staffordshire Ambulance Service), Duncan MacPherson (Department of Health), David Ward (Regional Emergency Planning Advisor, North West region), Gordon Tunley (Regional Emergency Planning Advisor, Oxford), Mike Williams (Accident and emergency (A&E), Essex), Ian Swann (A&E, Gloucester), Anthony Redmond (Disaster Medicine, Stoke), Roger Snook (Immediate Care, Bath), Tim Hodgott (Immediate Care/Disaster Medicine, Surrey), Barbara Phillips (Paediatric A&E, Liverpool), Lynn Williams (Paediatric A&E, Nottingham), John Leigh (Anaesthetics, Bristol), Fiona Jevons (Paediatrics, Cardiff), John Scott (BASICS/Immediate Care, Cambridge), Matthew Cooke (A&E/Immediate Care, Birmingham), Simon Davies (Nursing/Immediate Care, Staffordshire), Tracy Matthews (Nursing/A&E, Manchester).

31 Carley SD, Mackway-Jones K. The preparation for the prehospital surgical and non-surgical response to major incidents in the UK. Prehospital Immediate Care 1997;2:68–70.
33 Likert A. A technique for the measurement of attitudes. Arch Psychol (Frankf) 1932:22–55.