災害対策をめぐる国際協力の仕組みづくり研究調査報告書

2011年3月(公財)ひょうご震災記念21 世紀研究機構

(www.dri.ne.jp/updata/kokusaikyouryoku_5050.pdf　より一部抜粋)

第1節 大震災の教訓を踏まえた取組みとその結果

1.阪神・淡路大震災時における取組みと教訓

阪神・淡路大震災の直後、海外から救援の申し出が多数寄せられた。しかし、被災地域 においては、都市と輸送機能が麻痺し、また、人命救助等緊急対策への対応および海外か らの支援を受け入れる体制が十分に整っていない状況であった。さらに、被災地域において必要とされる支援と海外からの支援のミスマッチが発生し、海外からの支援が十分に活 かされなかったことを指摘された。

海外支援はどう受け入れられたか、また、どう受け入れたかについて、国連人道問題局 (DHA:United Nations Department of Humanitarian Affairs)および日本国内の関連機関によって、それぞれの立場から解説がある。

(1) 国連人道問題局(DHA)の評価(参考:「The Great Hanshin-Awaji (Kobe) Earthquake in Japan」DHA/95/141)

○チームの結成・スタンバイ

◆ 震災発生時間:1 月 17 日午前 5 時 46 分、地震が神戸を襲ったとき、グリニッジ標準時では、1 月 16 日午後 8 時 46 分、ジュネーブでは、午後 9 時 46 分、ニューヨークでは1月16日午後3時46分である。

◆ 情報通信:午後 11 時 21 分、ジュネーブの DHA 救援調整分局(RCB)のアジア太平洋モニタリング担当者が、東京の緊急連絡先に電話を試みたが、通じなかった。主任担当者は国際赤十字社と赤新月社に電話したところ、日本赤十字社は、姉妹機関からの救援を求めていないことを知らされた。日本政府も、日本赤十字社も、日本国際緊急援 助隊からの支援を要請しなかった。

◆ 対応:午前 8 時 30 分、東京の国土省(現在の国土交通省)の防災局に連絡。政府は、 必要なものを把握するためにアセスメントミッションを送ったこと、さらに救援チー ムが動員されているので、海外から神戸に向けた SAR チームの派遣は必要ないことを告げられた。

◆ チーム編成:1 月 17 日午後 4 時半、東京のスイス大使館は、25 匹の捜索犬、60 人の隊 員で構成し、24 時間以内に神戸に到着できる SAR チームの派遣を申し出た(要請に応 えて)。午後 5 時には、フランス大使館が、60 人の隊員と捜索犬に装備を備えて派遣することを申し出た。ロシアとイスラエルも、同日、特別な捜索救援チームの派遣を申し出た。1 月 18 日には、アルジェリア、ドイツ、ハンガリー、シンガポールも申し出 た。合わせて15 カ国が SAR チームの派遣を申し出た。

◆ 防災計画:1 月 17 日の夕方には東京の危機対応の関係機関も、交通の混乱が救助活動を妨げている原因で、専門的な SAR チームが不足ではないことをはっきりと認識した。国際 SAR チームからの申し出を受けたことは、東京都心部や東海地震ではなかったことから、少し驚きだった。緊急計画の担当者は、東京で地震が発生した場合の海外からの対応(自国民が居住している国から、もしくは世界経済に影響を及ぼす場合など)は想定していたが、ほかの地域の災害では想定外だった。また、地元の SAR チームも国際 SAR チームに依頼することは考えていなかった。彼らが望んでいたのは、 神戸に到着すると即座に地元の捜索救援チーム指揮系統に従うことのできる日本の捜索救援チームをさらに動員することだった。

○　国際 SAR チームの登場

◆ (国)東京の立場:東京では、国際 SAR チームを導入することが支援になると強く主張し始める人たちが出てきた。日本には、捜索犬がわずかしかいないことから、NFA は、“異なった技術”をもつスイスチーム

を捜索に受け入れることを決めた。一方、スイス大使館から、度々任務の重要点や、危険要素について問い合わせがあった。(国際 SAR チームが、余震などによる建物の崩壊で死亡した場合はどうなるか?)

◆ (自治体)神戸の消防指揮官:この決断を予測していなかった。国際 SAR チームの受け入れとなると、余計な準備が必要になる。通訳、特別な交通手段、宿泊場所の確保など。救援現場では、運営ベースを設営する場所もなかった。彼らは、自分たちの指 揮下で、即座に作業ができる国内の SAR の動員を望んでいた。

◆ 捜査活動開始:スイス捜索犬のチームを受け入れることに決まった。スイスのチーム は 1 月 18 日 13 時(日本時間 21 時)にチューリッヒを出発し、関西国際空港に 19 日 の午前 9 時 20 分に到着。ただちにヘリコプターで神戸に飛び、地元の消防救援指令者 から状況についての簡単な説明を受け、最初の救援現場に到着したのは 1 月 19 日 13 時 20 分だった(地震から 55 時間後)。8 人の通訳と東京から来た政府関係者が、スイ スチームのコーディネーターとして仕事をした。神戸、東京、大阪、熊本の消防団が スイスチームの捜索チームと一緒にレスキュー活動を行った。

同じく 18 日の夕方、東京のフランス大使館も再び、自国の SAR チームの派遣を申し 出た。60 人で構成するチームが利用する乗り物の手配と十分な通訳を確保できるかと いう点で繰り返し連絡があった。1 月 20 日午後、申し出を受け入れることに決まった。 兵庫県警がフランス SAR チームの地元受け入れ先となった。フランスチームは、関西国際空港に 1 月 21 日の午前 12 時 1 分、正午に到着した。

○ 捜査・救援活動の現場

◆スイスチームは、まず捜索現場の特徴についてブリーフィングを受けた。ほとんどが崩壊した木造家屋で、余震によって二次災害の恐れがあることなど。実際の捜索現場に案内されて彼らは初めて、これまで経験のない捜索現場であることを認識した。

◆ スイスのチームは、到着した日、徹夜して働くと主張した。日本のレスキュー隊は、適切な照明なしで働くという危険性、余震による崩壊の可能性、およびいかなる SAR隊員の二次災害による死傷も避ける必要性を指摘した。

◆ 3 人のメキシコ人男性の SAR チームも 1 月 22 日に神戸に来た。到着と同時に、彼らは、すでに国際 SAR チームはもう必要ないことに気付いた。そこで、彼らは、ほかの救援 作業にボランティアとして参加する意思を表明した。彼らは、兵庫県庁に登録され、 ガレキを片付けたり、崩壊した家から無傷の所有物を回収したりといった援助をした。 これらの援助は、助けを必要としていた高齢者によって、歓迎された。

(2) 内閣府による解説(参考:「阪神・淡路大震災教訓情報資料集」)

○受け入れ受け入れ体制が整わなかったことで、支援受け入れは数日後となった。

◆ 震災当日より諸外国からの支援申し入れが相次いだ。2 月 9 日までに 70 カ国・地域と 3国際機関からの申し入れがあり、44 カ国・地域(9 月 1 日現在)の支援を受け入れた。

◆ 政府非常災害対策本部に外務省は入っておらず、支援受入の窓口・判断体制も不明確だったため、震災直後の支援受入の判断には時間を要した。

◆ 震災翌日の閣議において、諸外国からの支援を積極的に受け入れることが決められた。

○ 海外からの支援受け入れは、現地での対応負担を増やすという側面もあった。

◆ 海外救助隊としては、スイス災害救助隊(1 月 19~22 日)、フランス災害救助特別隊(1月 21~24 日)、イギリス国際救助隊(NGO、1 月 23~26 日)などが活動した。 ◆ 海外救助隊による捜索の結果、遺体が発見されたが、生存者の救出には至らなかった。

◆ 混乱した被災地の自治体等に受入準備の負荷がかかったことから、現地の状況に配慮 しない支援受入には問題があったとの指摘もある。

◆ 人的被害に関する発表方法が確定数発表だったため海外に対して次々と被害者が増え ていくという誤解を与え、当初は捜索救助活動の支援不要としていた各国政府の認識 が変化したとの指摘もある。

2. 大震災の教訓を踏まえた取組み

阪神・淡路大震災の課題において、次のようになる。

1海外からの受入に関する国・地 方公共団体等関係機関の役割分担や費用負担。

2被災地域における海外からの支援要員の 活動支援体制(宿泊・移動の確保、通訳等)。

3海外に対する適切な情報提供(被害情報、 被災地域のニーズ等)。

これまでの各方面からの指摘を踏まえて、政府機関、地方自治体は 海外支援の受け入れに関する取組みを行った。

(1) 内閣府と関連省庁(外務省、総務省)

阪神・淡路大震災の教訓を踏まえ、「防災基本計画」の修正に当たって、海外からの支援 の受け入れについて、次のように定めた。(参考:「防災基本計画」中央防災会議、「南関東 地域直下の地震対策に関する大綱」第 4 章 総合的な災害対応能力の向上、中央防災会議、 国土庁防災局震災対策課、平成 10 年 6 月 23 日改定)

○ 海外からの支援受入れの「方針」

◆ 国際化、情報化が進展している状況の下、大規模震災時には外国からの人的、物的支援の申し入れが多数寄せられるようになっており、阪神・淡路大震災の教訓を踏まえ、 防災基本計画において、海外からの支援受入れに関する規定を盛り込むとともに、関 係省庁連絡会議において、受入れの可能性のある分野及び対応省庁と対応方針、受入れに関する手続きの流れなどについて申合せを行い、体制の整備を図っている。

◆ 南関東地域は、我が国の首都機能をはじめ社会経済活動に関する諸機能や人口が著しく集積する市街地が広範囲に広がっていることから、大規模地震が発生した場合の被 害は他の地域や国民生活のみならず、世界的に波及するなど極めて甚大な影響を及ぼすとともに、多くの外国人を有するという社会環境の特殊性から、海外からの支援申 し入れが集中することが予想される。このため、国は、海外からの支援受入れに関する関係省庁申し合わせ等を踏まえ、適切かつ迅速な対応に努めるものとする。

○ 海外からの支援受入れの「手続き」

◆ 外交ルートにて海外から支援の申し入れがあった場合には、外務省は緊急災害対策本部に対し、支援の種類、規模、内容、到着予定日時、場所等を通報する。

◆ 緊急災害対策本部は、外務省からの連絡を受け、被災地方公共団体及び関係省庁にニーズ等を照会し、支援受入れの可能性を検討する。

◆ 緊急災害対策本部が支援の受入れを決定した場合、あらかじめ定めた対応方針に基づ いて受入れ計画を作成し、関係省庁、被災地方公共団体に受入れ計画を提示するとともに、外務省を通じ、申し入れ国に対し、受入れ計画を通報する。その後、関係省庁 は受入れ計画に基づき支援を受入れる。

◆ 緊急災害対策本部が支援を受け入れないと決定した場合、関係省庁、被災地方公共団 体に受け入れない旨連絡するとともに、外務省を通じ、申し入れ国に対し、受け入れ ない旨通報する。

○内閣府による海外からの支援の受入れ活動(参考:「内閣府防災業務計画」第2編 震災対策編 第 1章災害予防 第2節迅速かつ円滑な災害応急対策、災害復旧・復興への備え、平成21年9月)

◆ 政策統括官(防災担当)は、災害時における海外からの支援の受入れの可否の判断、 受入れの実施が円滑に行われるよう、関係省庁と協力して、海外の支援機関について、 即座に到着が可能であるか、被災地等に過大な負担をかけさせない自己完結型である か等を調査し、その情報の蓄積を図る。また、関係省庁と

協力して海外からの支援の 受入れ可能性のある分野について検討し、その対応方針をあらかじめ定めておくとともに、海外からの支援を受け入れる場合に必要な諸手続について、あらかじめ定めておく。
[受入条件]:即座に到着が可能、自己完結型。
[国内機関]:受入れ可能性のある分野、受け入れる場合に必要な諸手続
○外務省の取組み(参考:「外務省防災業務計画」第1編災害一般に係る防災業務計画、第5章災害応急対策及び災害復旧、海外からの支援受入、平成 20 年 8 月)
◆第20条 関係する各局部等の長は、諸外国、国際機関等から支援の申入れがある場合には、その種類、規模、内容、到着予定日時、場所等を関係機関に通報する。在日米 軍からの支援の申入れがある場合も、また同様とする。 2)関係する各局部等の長は、関係機関と協議の上、支援の受入れの諾否及び受け入れる場合の支援内容を速やかに諸外国、国際機関等又は在日米軍に通報する。 3)関係する各局部等の長は、関係機関と協議の上、海外より支援を受ける必要がある と認める場合には、申入れの有無にかかわらず、諸外国、国際機関等に協力、援助等を要請する。在日米軍に協力、援助等を要請する場合も、また同様とする。 4)関係する各局部等の長は、諸外国、国際機関等からの支援要員又は物資の受け入れが円滑に実施されるよう必要な措置をとるとともに、関係機関に協力を要請する。在日米軍からの支援要員又は物資受入についても、また同様とする。
○総務省の取組み(参考:「消防庁防災業務計画」第2編防災に関しとるべき措置(基本対策編)、第5章災害応急対策 第4節災害応急対策の実施、14海外からの支援への対応、平成21年3月)◆ 政府本部が受入れを決定した海外から支援について、被災地方公共団体に連絡を行うとともに、必要に応じその円滑な受入れのための措置を講じる。

1. 阪神大震災から 16 年を経て依然とした問題点

◆ 「災害対策基本法」では、国、都道府県、市町村などの機関の責務が規定されている。 このほか、指定行政機関、指定公共機関の責務も規定されている。

◆ なお、災害対策基本法において、独立行政法人、認可法人、特殊法人及び民間会社の 中で、内閣総理大臣が指定するものを指定公共機関と位置づけ、災害対策に係る各種 の責務を課している。2010 年 4 月現在で 56 の機関が指定公共機関として指定されているが、この指定の中に独立行政法人国際協力機構(JICA)は含まれていない。

◆ 一方、海外からの人的・物資支援の受け入れは、INSARAG ルールに則って行われる。この INSARAG ルールを熟知しているのは JICA である。しかし、災害対策基本法上、JICA は何の責務もない、言い換えれば何の権限を持たないので、海外支援の受け入れに関して、ジレンマが生じる。

資料5

INSARAG
Preparedness – Response

MEDICAL GUIDANCE NOTE

Title:	**PROVISION OF MEDICAL CARE IN AN AUSTERE ENVIRONMNET, SPECIFICALLY IN A CONFINED SPACE**
Last revised:	**January 2011**

1. Background

1. The USAR environment presents the USAR medic with an array of ethical, cultural and environmental circumstances which could have an adverse affect when providing patient care.

2. This document aims to outline considerations specific to the provision of medical care in an austere environment, specifically confined space.

3. It is accepted that the healthcare provider will adhere to clinical practices as stipulated in their home country or in their framework of competence, and as governed by their professional code of conduct and scope of practice and will only divert from this in exceptional circumstances where a life is under threat.

4. While the individual's responsibility regarding their scope of practice remains in full effect, this document serves to provide guidance as how standard accepted practice may need to be adapted to accommodate the environment in which it is being applied.

5. It is recommended that evaluation of the victim commence as soon as contact has been established.

6. It is recommended that treatment begin as soon as the patient can be accessed.

2. Guiding Principles

As a guiding principle, prior to performing any clinical management consider the following:

- Discussing action plans with colleagues, team managers or other professionals when considering deviation from standard practise;
- Seeking guidance from OSOCC and or LEMA for sensitive interventions (e.g., amputation or dismemberment);
- Ask yourself the following key questions:
    - Do you or don't you?
        - Do you have the mandate to provide clinical management;
        - Is it safe to do so consider–self, team, patient;

- What is the likely outcome following your intended actions;
- Do you have the required resources available within the team, the wider USAR community and from the local infrastructure;
- Is there any ethical considerations evident;
- Is there any cultural considerations, both for the team and the victim, evident;

- Can you or can't you?
  - Do you have the required and continual access to the patient;
  - Is the required clinical intervention within your scope of practice and competency framework;
  - Do you have the required resources available within the team, the wider USAR community and from the local infrastructure;
- Will you or won't you?
  - What is the patients triage status;
  - How long will it take to achieve your objective and what implications will that have on the time to extrication;
  - Does the benefit of your intended action outweigh the foreseeable risk to self, team and patient;
- How to?
  - What is the safest option;
  - What is the least invasive option;
  - What is the least resource-intensive option;
  - Consider the implications of your intervention/s on patient egress;
  - Consider the implications for ongoing management during and following extrication;
  - Consider the use of technical search and rescue equipment to assist with patient assessment and evaluation (e.g., use of search camera to visualise parts of patient's body obscured by rubble).

3. Airway and Breathing Considerations

- Consider the most suitable option for managing the airway based on the given circumstances;
- You may not be able to achieve a definitive airway (e.g., intubation) so consider using more basic manoeuvres and airway devices (e.g., supraglottic airway device) as an alternative;
- Consider whether your chosen method can be safely sustained for the duration of the extrication;
- Consider that you may only have temporary access to the patient;
- You may not be able to make use of lateral position;
- Consider handheld/manual suction devices over mechanical devices as they are generally more portable and don't require auxiliary power;
- Consider having access to small/portable battery operated monitoring equipment e.g., SpO_2/End Tidal CO_2;

- Consider that you may not have access to another pair of hands due to restricted patient access;
- Your decision to assist with ventilatory support will be influenced by your ability to access the airway;
- Consider that you may not be able to provide the required ventilatory support via your chosen technique (e.g., maintaining an adequate seal with a BVM) and therefore you may have to resort to an alternative airway technique (e.g., supraglottic airway device);
- Consider the risks versus the benefits regarding drug-assisted intubation;
- Consider the duration of the whole extrication process when managing the airway with reference to:
    - Whether you have adequate supplies of medicine to keep the patient in the desired clinical state (e.g., sedated or anaesthetised);
    - The feasibility of manual ventilation (e.g., BVM);
- If you consider performing an emergency cricothyroidotomy, a Selldinger technique is preferable over a surgical airway;
- Medical Oxygen Considerations in USAR:
    - Consider the dangers of oxygen delivery in a confined space during rescue operations due to:
        - Potential fire risk;
        - Potential explosion risk;
    - Consider the non-availability of oxygen due to:
        - Aviation transport restrictions when deploying to the affected country;
        - Refilling restrictions (limited availability) in the affected country;
        - Regulator incompatibility;
        - The use of oxygen is likely to be the exception rather than the norm;
        - Consider the use of an oxygen concentrator as an alternative source of oxygen;
- Mechanical ventilation in USAR:
    - This capability exceeds the expected minimum requirements;
    - If a team elects to include a mechanical ventilator in its equipment cache consider the following:
        - Select air-driven mechanical ventilators with built-in compressor;
        - Consider using the least technologically advanced alternatives;
        - A USAR team deploying with a mechanical ventilator should develop a Standard Operating Procedure (SOP) and Clinical Practice Guideline (CPG) for its use within the team.

4. Circulation Considerations

4.1 Fluid Management

- Fluid administration routes:

- Consider the following methods of venous access:
  - Peripheral;
  - Intraosseous;
  - Venous cutdown;
  - Central (consider the risks associated with central venous access within a confined space);
- If intravenous access is not possible, consider alternative routes of fluid administration:
  - Orogastric;
  - Nasogastric;
  - Rectal;
  - Subcutaneous;
  - Intraperitoneal.

- Fluid volume:
  - Consider rate and timing of administration:
    - Volume replacement as required;
    - Fluid loading prior to removal of compressive load;
    - Maintenance administration;
  - Consider the available fluid resources;
  - Consider the ability to monitor haemodynamic status and fluid output in relation to fluid administered:
    - Urination:
      - Inform patient to tell you when they need to urinate (if possible);
      - Encourage patient to urinate;
      - Make note of times patient urinates;
      - Observe colour of urine, if possible;
      - It is not generally advisable to attempt bladder catheterization within a confined space. As an alternative consider the use of a condom catheter;
- Intravenous Fluid type:
  - If available, consider fluids that are either low or free of potassium and or lactate in patients suspected of having crush syndrome;
  - Preferably use isotonic solutions;
  - For fluid maintenance, consider alternating fluid types (e.g., NaCL and Dextrose);
- General considerations:
  - Consider insulating fluids to avoid extremes of temperature;
  - Consider the use of pressure infuser devices in conjunction with rate control devices to aid with fluid administration. Caution: Monitor volume administered carefully to avoid fluid overload;
  - Consider using adequate / circumferential strapping to secure IV sites;
  - Consider use of IV extension tubing to facilitate easier administration of fluid and medication;
  - Consider more than one site of access as security in case one site is dislodged;

- Adhere to sterile procedures as far as circumstance allows;
- Maintain security of IV tubing and bag.

4.2 Resuscitation

- CPR: One should carefully consider the implications prior to initiating CPR as it is generally not considered a viable option within the context of USAR and confined space;
- Defibrillation: One should carefully consider the implications prior to defibrillation as it is generally not considered a viable option within the context of USAR and confined space. There are several theoretical risks for consideration e.g.,:
  - Combustible environment;
  - Conductive elements (e.g., fluid; metal);
  - Inadequate patient access to safely perform the procedure;
- If you elect to perform advanced cardiac life support, it is recommended that the patient be rapidly extricated to a point that will enable good patient access in the safest possible environment.

4.3 Haemorrhage Control

- Consider that your chosen method of haemorrhage control may not be practicable either during disentanglement and or patient egress;
- Due to limited patient access, consider the potential role of tourniquets and haemostatic agents.

4.3.1 Tourniquets

- The use of a tourniquet requires access to a limb which may not always be possible within the confined space environment;
- Teams should have the capability to apply tourniquets to victims that may require an amputation. The tourniquet needs to placed such that it remains insitu during extrication and transport;
- There may be circumstances following an acute injury where a tourniquet provides the most effective means of haemorrhage control. When used in this setting, careful consideration must be given to the technique and time of application;
- There is a theoretical role for the use of a tourniquet to facilitate a rapid release of a compressive load;
- If a tourniquet has been applied then it should be clearly visible with the time of application recorded.

5. Disability and Drugs

5.1 Disability

- It may be difficult to determine whether a patient's clinical presentation is due to a spinal cord injury or a crush syndrome. In an effort to try and differentiate between a spinal cord injury and crush syndrome consider the following:
  - Are the signs focal or generalised;
  - Does the patient experience a lack of proprioception;
- If unable to determine whether it is a spinal cord injury or crush syndrome, consider opting to treat for crush syndrome primarily.

5.2 Drugs

- Teams are requested to carry the required medications to enable the treatment of the conditions listed in the **INSARAG Guidelines Section F11 Medical Care** and in accordance with their standard scope of practice;
- Although it is not the practice of the MWG to recommend specific practice or drugs, the consensus of the group is that the advantages provided by Ketamine argue strongly for its inclusion in the medical cache to provide as it provides:
  - appropriate and safe analgesia in the trauma patient;
  - appropriate and safe anaesthesia for trauma and surgically related procedures in both humans and search dogs;
- While intravenous access is the administration route of preference, if this is not possible due to restricted patient access, consider the following alternative routes of administration:
  - Oral;
  - Sublingual;
  - Inhalation;
  - Intranasal;
  - Intramuscular;
  - Intraosseous;
  - Subcutaneous;
  - Rectal.

6. Environment and Exposure

- Consider the environmental hazards impacting patient management:
  - Dust;
  - Noise;
  - Smell;
  - Light (lack of);
  - Vibration;
  - Water (e.g., broken pipes);
  - Electricity;
  - Noxious gases;
  - Deceased Bodies;
- Consider the environmental impacts (e.g., extreme hot or cold climates) and the effects this may have on patient management;

- Consider cultural considerations regarding patient exposure.

7. Patient Personal Protective Equipment

- When possible make use of Personal Protective Equipment (PPE) for the patient in an effort to reduce their exposure to environmental hazards during extrication;
- Patient PPE should be applied at the earliest opportunity during the rescue operation;
- PPE considerations include the following:
  - Eye protection;
  - Hearing protection;
  - Respiratory protection from:
    - Dust;
    - Noxious gases;
- Protect patient from falling debris as circumstance allow.

8. Removal of Compressive Force

- It is imperative that the rescue team understand the importance of treating the patient prior to release of the compressive force;
- The timing of the removal of the compressive force should be closely coordinated between the rescue technicians and the USAR medic;
- Ensure, as far as possible, an unobstructed egress route prior to the removal of the compressive force;
- Patients may appear stable as long as the compressive force is in place;
- Anticipate and try and prevent (pre-release fluid bolus) sudden patient deterioration following removal of the compressive force (e.g., third spacing; acute hyperkalaemia; metabolic acidosis);
- Attempt to place two large bore intravenous lines, or closest practical alternative, prior to removal of the compressive force;
- Ensure adequate supply of additional intravenous fluids is immediately available if required;
- Ensure immediate availability of resuscitation medications if and when needed prior to removal of compression;
- Consider the following release options in order of most to least desirable:
  - Controlled release of compressive load:
    - Commence administration of fluid bolus prior to removal of the compressive load;
    - Consider medication administration (e.g., sodium bicarbonate) prior to removal of the compressive load;
    - Incremental release of the load with ongoing patient evaluation and monitoring during and between lifts;
    - If patient shows sign of deterioration during the release, halt the release and manage patient as required (e.g., fluid bolus);

- If possible, wait for patient to stabilise prior to recommencing the release of the compressive load;

- Non-incremental release of the compressive load due to technique being used (e.g., a crane lifting a load):
  - Commence administration of fluid bolus prior to removal of the compressive load;
  - Consider medication administration (e.g., sodium bicarbonate) prior to removal of the compressive load;
  - As far as possible evaluate and monitor the patient;
- Rapid release of the compressive load:
  - Rapid deterioration in patients clinical status;
  - Life over limb;
  - Imminent safety threat to rescuers and or casualty
  - If circumstance allow, consider applying a tourniquet prior to the rapid removal of the compressive load;
- If there is an acute deterioration that does not respond to medical treatment during a controlled release of the compressive load, consider a rapid extrication.

9. Patient Immobilisation and Packaging

- In consultation with the rescue technicians, consider the egress route as this will influence immobilisation and packaging methods;
- Repackage the patient as required during the extrication process (e.g., taking patient through a 90 degree bend; vertical lifting);
- Consider time implications of packaging with regard to rescuer safety and the patients clinical status;
- Maintain the security of airway devices during extrication;
- Maintain the security of intravenous access lines during extrication;
- Provide immobilisation as required by the patients clinical condition and as determined by the environmental constraints;
- Maintain spinal immobilisation as required, whenever possible, throughout the extrication process;
- Remove non-essential equipment prior to packaging and extrication;
- Ensure all members of the team involved with the extrication are monitoring the patient.

資料6

INSARAG
Preparedness – Response

MEDICAL GUIDANCE NOTE

Title: **THE MEDICAL MANAGEMENT OF THE ENTRAPPED PATIENT WITH CRUSH SYNDROME**

Last revised: **February 2012**

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1. INTRODUCTION

1. The following clinical guideline has been developed by the INSARAG Medical Working Group (MWG) which consists of medical professionals actively involved in the urban search and rescue discipline. The MWG is comprised of representatives from 15 countries and organisations drawn from the three INSARAG regional groups.

2. This clinical guideline outlines a recommended approach to crush syndrome in the austere environment of collapse structure response. As such it is to be considered as a consensus statement by members of the MWG based on current medical literature and experience; it is not intended to be a prescriptive medical protocol. In addition it must be understood that these guidelines have been developed for application in an environment which may be complicated by factors such as:
    a. Hazards to rescuers and patients e.g., secondary collapse; hazardous material;
    b. Limited access to entrapped patient;
    c. Limitations of medical and rescue equipment within the confined space;
    d. Prolonged extrication and evacuation of patient;
    e. Delayed access to definitive care.

2. DEFINITION

INSARAG
Preparedness – Response

MEDICAL GUIDANCE NOTE

1. Crush Injury: Entrapment of parts of the body due to a compressive force that results in physical injury and or ischaemic injury to the muscle of the affected area, most commonly discussed in the context of collapsed structure incidents. If significant muscle mass is involved, it can lead to *crush syndrome* following release of the compressive force.

2. Crush Syndrome: A potentially life-threatening, systemic condition that can occur after release of a compressive force that has been applied to a muscle mass. The factors that lead to the development crush syndrome include:

    a. Degree of compressive force;
    b. Amount of muscle mass involved;
    c. Duration of compression.

3. The compressive force can be from one's own body weight in a static position or from an external source.

4. The onset of crush syndrome occurs following reperfusion of injured muscle when the compressive force is released. This may result in acute and or delayed-onset clinical sequelae.

5. The three primary acute pathophysiological concerns are:
    - Hypovolaemia which may result in shock;
    - Electrolyte imbalances including hyperkalaemia which may result in acute cardiac dysrhythmias;
    - Metabolic acidosis which may result in shock.

6. Delayed-onset pathophysiological concerns include:
    - Renal failure;
    - Adult Respiratory Distress Syndrome (ARDS);
    - Coagulopathy;

- Severe sepsis.

7. Delayed medical care and or inappropriate rescue management e.g., uncontrolled rapid removal of the compressive force before initiation of medical care e.g.; fluid administration, may result in rapid clinical deterioration and death of the patient.

3. CLINICAL PRESENTATION

1. All patients entrapped within a structural collapse environment should be considered to have some element of crush syndrome until proven otherwise. Rescuers and medical personnel should maintain a high index of suspicion of the potential for crush syndrome taking into account the following:

   - There may be no obvious physical signs of crush injury and the patient's vital signs may initially be normal;
   - Physical signs, when present, may include:
     - Mottled or blistered skin;
     - Oedema;

- Reddish-brown urine;
- Absent or diminished pulses in affected limbs;
- General signs of shock;

Photographs courtesy of Japan International Cooperation Agency (JICA)

- Symptoms:
  - Dysaesthesia (e.g.; paraesthesia; hypoaesthesia; hyperaesthesia);
  - Anaesthesia;
  - Pain:
    - Presence and level of pain may not reflect the level of severity of injury;
    - May be exacerbated on movement/release;
- Paralysis or paresis of the affected limbs.

2. Note: Crush syndrome may be incorrectly diagnosed as a spinal cord injury. This is an important differential diagnosis to make as the treatment regimes differ significantly. If in any doubt, treat as for crush syndrome whilst protecting the spine until spinal injury can be excluded.

3. Hyperkalaemia should be anticipated in crush injury. It should be identified and managed as early as possible. See Section 4.2.2 below.

4. MANAGEMENT STRATEGY

1. For the general approach to patient treatment in the confined space environment see *01 MWG_Provision of Medical Care in an Austere Environment Specifically in a Confined Space_ISG Approved Feb 2011*. If relevant, see also *05 MWG_Amputations and Dismemberment_ISG Approved Feb 2011*.

4.1. General Management

- It is imperative that the rescue team recognise the dangers of not treating the patient prior to release of the compressive force;
- The method and timing of the removal of the compressive force should be closely coordinated between the rescue technicians and the medical personnel.
- Removal of the compressive force should not be delayed as the severity of crush syndrome and compartment syndrome is proportional to the duration the area is crushed for;
- The method and route out of the rubble pile should be prepared prior to the removal of the compressive force;
- The required extrication equipment should be immediately available;
- Method of transport should be established early;
- Receiving healthcare facility should be identified as soon as possible.

4.1.2 Medical Management

- Entrapped patients may appear stable whilst the compressive force is in place;

- Anticipate what medical equipment and medicines may be required to treat the patient and ensure that these are immediately available prior to removal of the compressive force.

4.1.2.1 Fluid Management in Crush Syndrome

Important Considerations:

1. Currently there is no strong scientific evidence to support any single definitive fluid regime for the collapsed structure environment.
2. However, fluid administration remains the cornerstone of therapy for the medical management of crush syndrome and establishing adequate intravenous access and providing fluid is therefore of critical importance.
3. In the USAR environment, fluid loading of the patient is recommended as one of the most important actions **prior** to release of any compressive force.
4. The USAR environment usually precludes an ability to definitively monitor haemodynamic, electrolyte and metabolic status of the patient.
5. Special consideration should be given to the administration of lower rates and doses of fluid administration which may apply to:
    a. Those with lower muscle mass:
        i. Paediatrics;
        ii. Elderly;
        iii. Chronically malnourished;
    b. Patient with known co-morbid conditions e.g.; heart failure.

Fluid Administration

1. Fluid administration routes:
    a. Consider the following methods of venous access:
        i. Peripheral;
        ii. Intraosseous (IO);

iii. Venous cutdown;
iv. Central (least desirable, consider the risks associated with central venous access within a confined space);

b. If intravenous (IV) access is not possible, consider alternative routes of fluid administration recognising their limited effectiveness (poor absorption) and potential side effects e.g., regurgitation:
   i. Orogastric;
   ii. Nasogastric;
   iii. Rectal;
   iv. Subcutaneous (avoid administration in crushed area);

2. Intravenous Fluid type:
   a. Preferably use warm, isotonic, potassium free solutions.
3. Fluid volume:
   a. Fluid administration is not simply aimed at replacing what is lost. There are multiple reasons for fluid administration during various stages of the extrication:
      i. Volume replacement as required to achieve haemodynamic stability;
      ii. Fluid loading to compensate for the sequestration of intravascular fluid into the interstitial space;
      iii. To maintain adequate renal perfusion and prevention of renal damage. This may require the use of volumes of fluids that may exceed volumes usually administered to a trauma patient.
      iv. To address maintenance fluid requirements.
   b. Volume:
      i. There is no strong scientific evidence to support any particular dose of administration. However, the literature supports the use of high volume fluids during extrication.
      ii. Many authors recommend 1 to 1.5 litres per hour for the adult patient until hydration status can be verified.
      iii. This may be augmented by intravenous fluid boluses.

iv. The principles of damage control resuscitation (e.g.; permissive hypotension) may not necessarily apply.

4. Other General recommendations:
   a. Insulate fluids in cold environments;
   b. Use pressure infuser devices in conjunction with rate control devices to aid with fluid administration. The confined space environment often precludes being able to place the intravenous fluid container above the level of the patients heart thereby preventing fluid flow or resulting in blood back flow up the administration set. Do not delay fluid administration waiting for equipment as manually squeezing the bag is an effective interim measure;
   c. Ensure IV sites are adequately secured;
   d. Use IV extension tubing to facilitate easier administration of fluid and medication;
   e. Use two sites of intravenous access, if possible;
   f. Adhere to sterile procedures as far as possible;
   g. Monitoring haemodynamic status using urinary output can be difficult to assess in the USAR environment, however:
      i. Encourage patient to urinate into a container if possible if they feel the need;
      ii. Make note of times patient urinates;
      iii. Observe the colour and estimate the volume, if possible;
      iv. It is not generally advisable to attempt bladder catheterization within a confined space. As an alternative consider the use of a condom catheter in a male patient.
      v. Be aware of the patient with a full bladder who is no longer producing urine i.e. a single collection of urine is not always a reliable confirmation of ongoing renal function.

4.1.2.2 Medications