

## “Bomb Explosion On The Nis Express” – Lessons From A Major Incident, Kosovo 16 Feb 2001

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### ABSTRACT

**On Friday 16 February 2001, terrorists detonated a bomb under a civilian coach travelling from Nis in Serbia to Gracanica in Kosovo. 10 people were killed at the scene. 13 casualties were treated in the British KFOR hospital (Reynolds Hospital) in Pristina. Another 8 casualties were evacuated to the American KFOR hospital at Camp Bondsteel. The incident provided a unique opportunity for co-operation between British, American, Russian, German and French KFOR hospitals, as well as with Serbian clinicians and forensic pathologists. This article analyses the medical management of this major incident, identifies the lessons to be learned from it, and also provides enough detail for teaching scenarios.**

### Introduction

NATO peacekeeping troops have been in Kosovo since June 1999. They have divided the province into five MultiNational Brigade areas led by the French (in the North), the British (Central), the American (East), the German (South) and the Italian (West) (Figure 1). Considerable tension remains between Kosovar Albanians and Serbs, with Albanian extremists intimidating Serbs remaining in Kosovo.

### The Incident

A convoy of “Nis Express” coaches regularly transports Serbian civilians between Nis in Serbia and a pilgrimage site in Gracanica in Kosovo, escorted by KFOR armoured cars.

At 1112 hrs on Friday 16 February 2001, a 200+kg high explosive bomb was detonated in a culvert under the front of the first coach of a convoy 800 metres south of Gate 3 at the Kosovo – Serbia border, north of Podujevo in the area of responsibility of the Second Royal Tank Regiment (2RTR) Battlegroup. The coach was blown upwards by the blast, but its momentum carried it onwards until it halted abruptly on the road 18 metres beyond the crater (Figure 2). The coach contained about 56 adults and children. The driver and nine passengers in the front three rows of seats were killed instantaneously, their bodies being ejected up to 100 metres away. 21 other passengers were injured. It has been impossible to determine whether any others subsequently presented directly to Serbian hospitals.



Fig 2. Nis Express Coach and scene of explosion.

### British Medical Assets

**Pre-hospital:** A Battlefield Ambulance from 1 Close Support Medical Regiment (1CSMR) was on standby at Podujevo Police Station. A Regimental Aid Post, with a Regimental Medical Officer (RMO 2RTR) and 12 medics, was situated in Waterloo Lines 8 km further south.

**Secondary care (Reynolds Hospital):** The Role 3 medical facility for Multi-National Brigade (Central) [MNB(C)] was Reynolds Hospital (Figure 3) in Pristina, named after Surgeon Major James Henry Reynolds, awarded the Victoria Cross in the Zulu War of 1879. This 25-bed hospital had opened on 6 December 1999, replacing 22 Field Hospital’s facility in Lipjan. It was due to amalgamate with the American KFOR Hospital at Camp Bondsteel in May 2001. In Feb 2001 this hospital had 45 staff drawn primarily from 33 Field Hospital. It had one consultant general surgeon, one consultant maxillofacial surgeon, two anaesthetists

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Fig 1. Kosovo and KFOR hospitals.

(consultant and registrar), and a consultant physician. Further staff included a General Duties Medical Officer (GDMO), a radiographer, a laboratory technician, four HQ staff, 14 nurses and Health Care Assistants (HCAs), and six Combat Medical Technicians (Cbt Med Techs). The Emergency Department (A&E) had three resuscitation bays. There was a 13-bed ward, a 2-bed intensive care unit and two operating theatres. A 10-bed ward was reserved as a Priority Two (P2) area for major incidents.



Fig 3. Reynolds Hospital.

**Aeromedical assets:** The MNB(C) Joint Helicopter Force, at Pristina airport, consisted of two Royal Air Force Pumas and a Gazelle. One Puma was always on 30 minutes standby as part of the Incident Response Team (IRT). The IRT was under direct control of HQ MNB(C). It provided an Explosives Ordnance Disposal (EOD) and medical response to incidents in the Brigade area of operations. The medical element consisted of an anaesthetist and an operating department practitioner from Reynolds Hospital.

Table 1. Sequence of events, Fri 16 Feb 2001.

Time	Event
1112 hrs	Explosion
1125 hrs	1st ambulance arrives at scene
1127 hrs	MNB(C) Major Incident Plan activated
1130 hrs	Reynolds Hosp - Major Incident Declared
1135 hrs	RMO & 2nd ambulance arrive at scene
1140 hrs	1st Puma arrives at scene
1200 hrs	1st Puma leaves scene with 4 xP1 casualties (cas)
1200 hrs	2nd Puma (IRT) arrives at scene
1200 hrs	Bondsteel – Major Incident Plan Declared
1210 hrs	Reynolds – First 4 cas arrive (1st Puma flight)
1215 hrs	2nd Puma leaves scene with 1xP1, 2xP2 cas
1230 hrs	Reynolds – 3 cas arrive (2nd Puma flight)
1250 hrs	Last casualties leave scene in 3rd & 4th Puma flights (Hospitals <b>not</b> notified that scene is clear of casualties)
1300 hrs	Reynolds – 3 cas arrive (3rd Puma flight)
1310 hrs	Bondsteel – First cas arrives (4th Puma flight)
1315 hrs	Reynolds – 3 cas arrive (by ambulance)
1355 hrs	Reynolds – IRT anaesthetist returns from Bondsteel
1345 – 1430	Bondsteel – 3 Blackhawks bring in 7 xP3 cas
1410 hrs	Reynolds – 1st operation starts (Patient 2)
1700 hrs	Bondsteel – 1st operation starts (Patient 5)

**Other Secondary Care Assets**

**American (Bondsteel Hospital):** The 36-bed Hospital Surgical Unit at Camp Bondsteel, manned mainly by US Army Reserves from the 313th Hospital Unit Surgical, was the Role 3 medical facility for Multi-National Brigade (East) (MNB(E)). The hospital had 140 staff, which included two general surgeons and one orthopaedic surgeon. It had the only CT scanner for KFOR troops, and four dedicated aeromedical evacuation UH60 Blackhawk helicopters from the 236th Medical Company (Air Ambulance).

**Other KFOR hospitals:** There was a Russian 30-bed hospital in Kosovo Polje in MNB(C), a French 25-bed hospital in Mitrovica in MNB(N), an Italian 50-bed hospital in Pec in MNB(S), and a German 60-bed facility in Prizren in MNB(W).

**Serbian:** There was a 650-bed General Hospital in Mitrovica, in the Serbian area in northern Kosovo.

**The Emergency Services Response to the Incident (Table 1)**

**Priorities at the scene - MIMMS guidelines (1-3)**

- C – Command & Control
- S – Safety (oneself, the scene, the casualties)
- C – Communications
- A – Assessment (using METHANE acronym)
- T – Triage
- T – Treatment
- T – Transport

## C - Command and Control

**The scene response.** The lead armoured car immediately notified HQ MNB(C), which deployed Military Police, a battlegroup response vehicle (with Defence Fire Services), and the ambulance from Podujevo. On arrival, the ambulance commander (a Cbt Med Tech Corporal) established a medical incident point on the road at a safe distance (about 20 metres) from the coach, adjacent to the police and battlegroup vehicles. This facilitated close liaison with the respective incident officers (who formed the “Silver” level of command in UK major incident terms).

**The HQ response (“Gold”).** After receiving confirmation from the scene (see below), HQ MNB(C) activated the Brigade Major Incident Plan. It diverted an airborne Puma to the scene and despatched the IRT Puma to pick up the EOD and medical teams. Med Branch at HQ MNB(C) coordinated the medical response. Reynolds Hospital was designated as the main receiving hospital and all other KFOR hospitals were placed on standby.

**The Hospital response.** The actual message received at A&E was “Bomb explosion on the Nis Express Train (sic), IRT needed with surgeon and medics”. Despite the ambiguity of the message, the Major Incident plan was activated. A Senior Medical Officer (SMO) (an experienced general practitioner) was fortuitously at the hospital. As it was not known what medical assets might be at the scene, the SMO was despatched with the IRT, to act as Medical Incident Officer or provide support as required.

Box 1. METHANE message relayed from scene by the ambulance commander.

M (My callsign)	H20
E (Exact location)	GR 186525
T (Type of incident)	Coach explosion, bomb is cause
H (Hazards)	Power lines
A (Access)	Direct by road, by air from south
N (Number of cas, severity)	7+ cas (2xP1, 4xP2, 1 other, numerous P3)
E (Emergency services)	Require IRT, Fire, Amb.

## S – Safety

After the explosion the immediate concern was that the convoy might come under further attack, so the armoured cars took up defensive positions covering the coaches. Further action was directed to swiftly extricate casualties from the coach. In the initial chaos some survivors ran into surrounding fields, not thinking that they might have been mined. KFOR troops rapidly established a semblance of order. They loaded uninjured survivors and most of the walking wounded onto the other coaches, directing them to the safety of the border crossing. A helicopter landing site was established on the road about 100m south from the coach. On arrival the EOD team started searching for secondary devices.

## C - Communications

Communication from the scene was by radio to Brigade HQ, or directly by ambulance radio to the Med Sqn Ops Room, which relayed messages to A&E. HQ MNB(C) also despatched its Gazelle to the scene. This provided a communications relay service between ground and air radio nets.

## A - Assessment

The Cbt Med Tech Cpl commanding the first ambulance sent his scene assessment to Med Branch at HQ MNB(C), using the METHANE formula (see Box 1). This message, and similar ones from the police and battlegroup incident officers, confirmed the nature of the incident and initiated the Brigade Major Incident Response.

## T - Triage

The Cbt Med Tech Cpl then commenced triage of casualties using the triage sieve (3-4). The British military use Priority 1, 2 and 3 triage categories, equivalent to the NATO triage categories of Immediate, Urgent and Delayed. There were no expectant casualties. On arrival, the RMO 2RTR took command as Medical Incident Officer and reassessed the wounded.

## T – Treatment.

**“Deliver to the surgeon a live casualty” - BATLS Motto**

A nurse in the convoy’s ambulance had commenced first aid treatment. Thereafter the casualties were managed according to Battlefield Advanced Trauma Life Support (BATLS) protocols (4).

The RMO performed a needle thoracocentesis to relieve tension pneumothorax in a critically ill patient (Patient 1). The patient regained consciousness and was evacuated on the first helicopter to Reynolds. The RMO had no facilities for formal chest drainage. The IRT Puma arrived just as the first Puma was leaving with four casualties. The RMO briefed the medical team and SMO, who then helped treat the remaining four P2 and six P3 casualties.

## T - Transport

**“Get the right patient to the right place in the right time - Do not transfer the major incident from the scene to the hospital”**

Once the scale of the incident became clear,

HQ MNB(C) requested assistance from HQ MNB(E), which deployed three Blackhawks to the border crossing to collect seven walking wounded, and activated the Major Incident Plan at Bondsteel.

The two Pumas rapidly loaded casualties according to triage priority and transported them in a shuttle service to hospital. The first three flights went to Reynolds (10 minutes flying time away) and the fourth went to Bondsteel (20 minutes flying time). Med Branch at HQ attempted not to overburden Reynolds, obtaining confirmation that more casualties could be accommodated before sending the second and third flights there. Three patients left the scene by ambulance. The last patient (Patient 14) left the scene 1h 40 mins after the explosion, on the 4th flight. As she had a fractured femur, the presence of an orthopaedic surgeon at Bondsteel determined her destination. 13 patients were initially transported to Reynolds and 8 to Bondsteel.

### Casualty Management at Hospital (Table 2)

Both hospitals' Major Incident Plans incorporated dual clinical and administrative command and control. At Reynolds, where there was only one general surgeon, it had been decided surgery would not be performed during reception of mass casualties unless deemed absolutely necessary to save life. The general surgeon would act as clinical co-ordinator and triage officer.

### Triage

**Reynolds.** The first casualties arrived at 1210hrs, one hour after the explosion. The only information received beforehand was that 4xP1 casualties were en route. They were re-triaged as 3xP1 and 1xP2.

P1 casualties were directed to the three Resus Bays, P2 casualties to the P2 ward, and P3 casualties to the physiotherapy tent. A casualty board with essential demographic details, mass casualty number, triage categories and diagnoses, and destination in the hospital, was maintained in the triage area. The 13 casualties arrived within the space of 70 minutes. 3 were triaged as P1, 4 as P2, and 6 as P3.

**Bondsteel.** The first casualty (patient 14) arrived at 1310 hrs. A senior NCO performed triage at the entrance to the Emergency Medical Treatments tent. Urgent (P2) casualties were directed to trauma stations in the Resuscitation area, whilst Delayed (P3) casualties were directed to the sick call waiting area. There were no Immediate (P1) casualties.

### Treatment

**Reynolds:** Trauma teams of doctors, nurses, and combat medical technicians were assigned to each P1 patient. The consultant

anaesthetist, maxillofacial surgeon, GDMO, and an RMO from the adjacent Primary Health Care Centre were assigned to this area. Three additional RMOs arrived and were assigned to the P2 area. Teams of one nurse and one HCA staffed each P2 bed, with treatment supervised by the consultant physician. The dentist, physiotherapist and a HCA treated P3 casualties until a RMO and nurse became available. All patients with penetrating trauma received tetanus toxoid booster and benzylpenicillin.

### Case scenarios: four severely injured patients [Injury Severity Score (ISS) >15]

**Patient 1.** (50 year old male; ISS 38, Revised Trauma Score [RTS] 6.8). On arrival he had a single Venflon in the second right intercostal space, his respiratory rate was 48/minute, systolic blood pressure 88mm Hg, and Glasgow Coma Scale [GCS] 15. A chest Xray (performed just before chest drain insertion) showed a large pneumothorax. Ultrasound showed a large perisplenic haematoma. He was haemodynamically stable, so operation was postponed pending receipt of all casualties.

**Patient 2.** (52 year old female; ISS 29, RTS 5.4). On arrival her respiratory rate was normal, first recorded systolic blood pressure 50mm Hg, GCS 10. Primary survey revealed no obvious head, chest, abdominal or pelvic injury. She had extensive grossly contaminated soft tissue wounds of the left leg and a severely displaced compound fracture dislocation of the right ankle. This was reduced on arrival, resulting in restoration of pedal pulses. She was moved to the P2 ward for further resuscitation as another P1 casualty was expected imminently. After an hour she developed left upper quadrant tenderness. Ultrasound showed a large perisplenic haematoma.

**Patient 3.** (47 year old female, ISS 24, RTS 7.8). She had a large abrasion over the sternum and severe sternal pain. A chest Xray showed mediastinal widening, and cervical spine Xrays suggested C5 on C6 subluxation. She remained haemodynamically stable.

**Patient 5.** (58 year old female, ISS 16, RTS 7.8). As a walking casualty, she was triaged as P3. After an hour she complained of increasing left upper quadrant abdominal pain, and ultrasound revealed a large perisplenic haematoma. She remained haemodynamically stable.

**The surgical dilemma.** By 1330 hrs it was evident three patients (Patients 1, 2 & 5) had intra-abdominal bleeding, requiring laparotomy, and Patient 3 had signs consistent with early aortic disruption. Uncertain whether more patients were en route, it was decided to wait until the IRT anaesthetist returned before operating on Patients 1 and 2, and to transfer Patients 3

Table 2. Case Summaries.

Case (sex, age)	Time of arrival at Reynolds (R) or Bondsteel (BS), 16 Feb 01	Injuries (AIS 98 scores)	P1,2,3 on arrival in hosp	Injury Severity Score (ISS)
1 (M, 50)	1215 (R)	Right tension pneumothorax (5), pelvic fracture (right superior pubic ramus) (2), right foot fractures (cuneiform & navicular) (2), large left retroperitoneal haematoma (3)	P1	38
2 (F, 52)	1215 (R)	Massive left retroperitoneal haematoma (4), splenic laceration (2), liver laceration (2), compound fracture-dislocation right ankle (3), degloving injury left lower leg (2)	P1	29
3 (F, 47)	1220 (R)	Sternal fracture (2), haemomediastinum (4), left neck laceration (1), pelvic fracture (2)	P1	24
4 (M, 64)	1220 (R)	Large laceration right forehead (2), laceration left arm (1)	P2	5
5 (F, 58)	1230 (R)	Ruptured spleen (4)	P3	16
6 (M, 30)	1230 (R)	Minor scalp laceration (1)	P3	1
7 (M, 50)	1230 (R)	Facial bruising (1)	P3	1
8 (F, 33)	1300 (R)	Lip laceration (1), crush fracture L2 (3)	P2	10
9 (F, 65)	1310 (R)	Pelvic fractures (left acetabulum & inferior pubic ramus) (3)	P2	9
10 (M, 62)	1310 (R)	Loin bruising (1), haematuria (2)	P3	5
11 (F, 41)	1315 (R)(by road)	Fracture nose (1)	P3	1
12 (M, 40)	1315 (R)(road)	Fracture left lateral malleolus (2)	P2	4
13 (F, 14)	1315 (R)(road)	Bruised left flank (1)	P3	1
14 (F, 21)	1310 (BS)	Right intertrochanteric femoral fracture with neck extension (3), right ankle medial malleolus fracture (2)	P2	13
15 (F, 44)	1345 (BS)	Crush fracture, T-11 (2)	P2	4
16 (M, 52)	1350 (BS)	Contused elbow (1)	P3	1
17 (F, 28)	1405 (BS)	Cerebral concussion (2)	P2	4
18 (M, 51)	1405 (BS)	Fracture left tibia (3), nose laceration (1)	P2	10
19 (F, 44)	1410 (BS)	Crush fracture L-1 (2), L-2 (2)	P2	8
20 (F, 20)	1415 (BS)	Right leg bruising (1)	P3	1
21 (F, 20)	1430 (BS)	Head bruising (1)	P3	1

and 5 (the most stable) to Bondsteel. Patient 2 precipitated events by becoming haemodynamically unstable, so underwent emergency laparotomy at 1410hrs.

### Further management (Table 3)

**Patient 2.** Laparotomy revealed free intra-

peritoneal blood, a massive retroperitoneal haematoma, and a bleeding mesenteric artery, which was ligated. There were minor lacerations of spleen and liver, and bruising of the proximal jejunum and transverse mesocolon. By this stage her core temperature had dropped to 31.6C and she

had developed a coagulopathy, so the retroperitoneal haematoma was not explored and surgery was terminated. She was actively rewarmed, an emergency blood donor session was instituted and she was infused 3 units of fresh warm blood. This corrected her coagulopathy. Once her core temperature reached 36C her leg wounds were debrided. She received 19 units of blood and 5 units of fresh frozen plasma in all. She was ventilated on ITU pending transfer.

**Patient 1.** Laparotomy revealed free intra-peritoneal blood, a large left-sided retroperitoneal haematoma, and bruising of the proximal jejunum, transverse mesocolon and mid-transverse colon. The retroperitoneal haematoma was not explored, and no further procedure was performed. He received 6 units of blood in all. He was ventilated post-operatively for better management of blast lung injury pending transfer.

**Patient 5** underwent splenectomy at

Bondsteel.

**Patient 3.** CT scan at Bondsteel showed a flail sternal fracture and a large anterior mediastinal haematoma, but excluded significant aortic or neck injury. She was intubated and ventilated for two days, and treated with hypotensive therapy (nitroprusside, then labetalol), before transfer to the Russian KFOR hospital.

### Transfusion requirements

**Reynolds.** 44 units of blood were initially requested. As only 29 units were in stock, 15 units were flown over from Bondsteel. A nurse and HCA ran the emergency blood donor session, collecting 10 fresh units from carefully screened British Army volunteers from the adjacent camp. The donated blood underwent ABO and Rh D grouping, and screening for atypical serologic antibodies, HIV 1 and 2, and syphilis. Three of these units were transfused into Patient 2. Remaining donated blood was destroyed

Table 3. Operations Performed.

Case (sex, age)	Operative procedures	Interval from explosion to op	Start of op (hrs)	Length of op	Comments
<b>Reynolds</b>					
2 (F, 52)	Exploratory Laparotomy (op terminated due to hypothermia and coagulopathy, with need for Damage Control Surgery)	3hrs	1410	80 minutes	Maintained on ventilator on 1st operating table for rewarming for next few hours
1 (M, 50)	Exploratory Laparotomy	6hrs 15mins	1730	90 mins	2nd table
4 (M, 64)	Suturing of face and arm	9hrs 30mins	2045	85 mins	2nd table
2 (F, 52)	Wound excision left lower leg, wound excision right ankle	12hrs 15mins	2330	105 mins	1st table
8 (F, 33)	Suturing of deep lip laceration (LA)	14hrs 15min	0130	60 mins	2nd table
<b>Bondsteel</b>					
5 (F, 58)	Laparotomy, splenectomy	5hrs 45mins	1700		Tranferred from Reynolds for op
3 (F, 47)	Exploration neck wound	No data			Tranferred from Reynolds
18 (M, 51)	Open Reduction & Internal Fixation fracture tibia	No data			
<b>German Hospital</b>					
14 (F, 21)	Open Reduction & Internal Fixation fracture femur	< 24 hrs			Tranferred from Bondsteel for op, discharged after 10 days

after the incident. Serum samples from each donated unit were later sent to the UK, where tests excluded Hepatitis B and C. 25 units of blood were transfused in all.

### Transfer to definitive care

**Bondsteel.** After stabilisation, Patient 14 was transferred to the German KFOR Hospital for definitive surgery as this hospital had appropriate orthopaedic implants.

**Reynolds.** Patients 3 and 5 had been transferred to Bondsteel. The next morning Patient 8 was transferred to the Russian KFOR hospital, and Patients 6,7,10, 11 and 13 were discharged. Once contact was established with Mitrovica Hospital the two ventilated ITU patients (Patients 1,2) were transferred there by helicopter (via the nearby French KFOR hospital's helipad and ambulances), followed by Patients 4,9 and 12 by ambulance. All transferred casualties had typed discharge summaries, translated into Serbian. All patients had left Reynolds by 1700 hrs. All the oxygen cylinders in Reynolds, and most of the resupply cylinders, had been depleted.

### Forensic Investigation

Once all wounded had left, UNMIK police and a UN forensic pathologist carried out a full forensic investigation of the site. The appropriately labelled human remains were then taken to a temporary body holding facility (a refrigerated container) at Reynolds.

The UN pathologist performed the initial forensic examination in a temporary morgue at Reynolds. Three forensic pathologists from Belgrade arrived on the third day and completed the post-mortem examination, recording findings in the internationally accepted Interpol Disaster Victim Identification forms. Only one body was intact. Moderate bodily fragmentation had occurred in 6 victims, and gross fragmentation in 3 others. There was a preponderance of lower limb trauma, including several traumatic amputations through mid-tibia and mid-femur. There were no amputations through joints. Severe head destruction had occurred in 5 cases. It was impossible to match all body parts, therefore raising the possibility that there might be more than 10 victims, so two equivalent sets of samples were taken for DNA analysis from each body except the intact one. UNMIK police retained one set, and the other was taken to Belgrade. It took the 4 pathologists 6 days to identify 9 of the 10 victims. No next-of-kin presented to identify the 10th body. The dead comprised 3 females (age range 20 to 29 years) and 7 males (age range 2 to 62 years), including one family group (husband, wife and son).

### Discussion

A major incident for the medical services is

defined as a situation where extraordinary medical arrangements have to be made to cope with the number, severity, type or location of live casualties (1). The "Nis Express" coach bombing was such an incident.

### A: Preparation

**Preparation for a major incident involves education, planning, and exercise.**

**i. Education:** This focuses on two aspects:

- *management* - through courses such as MIMMS and HMIMMS (*Major Incident Medical Management and Support: the practical approach at the scene/at the Hospital*);
- *treatment* - through courses such as ATLS®, BATLS/BARTS (4), and DSTS (*Definitive Surgical Trauma Skills*)(5-6), and relevant textbooks(7-8).

The MIMMS courses in particular, with their CSCATTT framework, provide a structured, internationally accepted approach to the major incident scene (the medical management) and to dealing with multiple casualties (support) (1-3). MIMMS has been the UK Defence Medical Services standard since 1996 and NATO doctrine since 2003, its principles had been actively promulgated in Kosovo, and it underpinned the management of this incident.

**ii. Planning.** The advance formulation of a major incident plan is crucial for successful management of a major incident (9-10). The Reynolds Hospital Major Incident plan was based on a generic format designed by the DMS Specialty Adviser in Accident & Emergency Medicine.

**iii. Exercise.** Every medical unit should regularly exercise communications, clinical co-ordination, triage, treatment of various injuries in different settings, trauma documentation, and interservice working arrangements. The value of exercise was well illustrated by Bondsteel, which had just held a mass casualty exercise with 30 casualty simulation patients. The lessons identified were successfully implemented during this incident.

### B: Management at the scene

#### Safety

Medical and other rescue personnel are at high risk of secondary devices in terrorist incidents (11). It was fortunate that no such devices were placed around the scene, as these would have caused many more casualties, both KFOR and civilian.

#### "Scoop and run"

The use of aeromedical helicopters to speedily retrieve casualties has been fundamental to military medical planning since the Korean War (12). Treatment at the scene concentrated on life-saving measures,

care being taken not to delay helicopter evacuation.

### The Incident Response Team

The composition of the IRT in Kosovo resembled that in Bosnia (13). In a major incident in Kosovo the local RMO (usually a junior doctor) normally acted as Medical Incident Officer. In Bosnia an experienced SMO deploys with the IRT as Medical Incident Officer, enabling the anaesthetist to concentrate on treatment and transport of the critically ill, and to return speedily to hospital. This is a better use of specialists' expertise.

**In a major incident a senior MIMMS-trained pre-hospital clinician should form part of the Incident Response Team.**

## C: Management At Hospital

### Reception and definitive care

There are two phases in the hospital management of casualties in a major incident (2,14). *The reception phase* is while the incident is evolving, casualties are arriving, and the scale of the incident is unknown. The priority here is to conserve key resources and facilities for a yet-unknown number of critically injured patients by providing minimal acceptable care to all others. The difficulty lies in defining minimal acceptable care – for instance, how long can one safely delay laparotomy for ruptured spleen? This was the dilemma faced at Reynolds. Damage control surgery applies the principles of minimal acceptable care to save the lives of the most critically injured patients. It is particularly applicable in a military setting and in major incidents (8,15-17).

The *definitive care phase* occurs after all casualties have arrived, their injuries have been defined, and hospital resources are fully mobilised. Definitive care can now be provided according to triage priorities.

### The Role Of Physicians

In addition to supervising the care of P2 casualties and resuscitating a critically injured patient, the consultant physician took over as clinical co-ordinator once surgery started. The next day he took an active part in the combined ward round with two local doctors. This illustrated the potential for military physicians to be more actively involved in clinical co-ordination and major incident management.

### Focused Abdominal Sonography for Trauma (FAST)

**Every patient with a potential abdominal injury should undergo a FAST examination.**

Three patients (Patients 1,2,5) had ultrasound findings consistent with intra-

abdominal bleeding, confirmed at laparotomy. Conservative management of splenic rupture is not feasible in a major incident or field surgical conditions. Diagnostic peritoneal lavage was not performed in any patient, with ultrasound being the investigation of choice. This is standard British military practice for blunt abdominal trauma, corroborated by civilian practice (18-20) and extensive Israeli experience (10). The high incidence of splenic trauma in this and other explosions (21) illustrates the need for vigilance.

### Blood Transfusion

Patients 1 and 2 were the only patients to receive blood at Reynolds. Experience elsewhere has shown most injuries (apart from amputations) do not need transfusion, with the transfusion trigger safely being lowered to a haematocrit of 21% (Hb 70g/L) (22). A field hospital has limited bloodbank resources and no platelets.

**An emergency blood donor panel should be set up at the start of all operational deployments.**

Whole blood therapy is exceptionally rare in the developed world, but remains of critical importance in austere environments (22-23). Freshly donated warm blood, with its full complement of platelets, can be lifesaving.

### Transfer To Definitive Care

The total time from the explosion to evacuation of the last patient from Reynolds was 29 hours 50 minutes. This time is similar to other incidents. 28 hours 15 minutes elapsed between a Hip helicopter crash in Bosnia and the last patient leaving Hospital Squadron Sipovo for Prague (24). It took almost 29 hours from the first soldiers being wounded in the British hostage rescue operation in Sierra Leone (OP BARRAS) (25) to the last patient leaving RFA SIR PERCIVALE for the UK (Vassallo DJ, unpublished data). This speedy evacuation reflects the military necessity to restore the ability of the medical unit to accept further mass casualties as soon as possible, and the clinical need for further definitive care of ITU patients. The “**30 hour / next-day rule**” is a useful guide to the time a field hospital may have to manage mass casualties prior to evacuation in operations other than war.

## D: The wider picture

This unprovoked attack on unarmed civilians caused international outrage (26) and was condemned by the UN Security Council (27). The active involvement of the forensic team from Belgrade (28) and its close cooperation with UN police and NATO troops helped defuse the political tension. This was the first time forensic experts from the

Federal Republic of Yugoslavia had participated in UN investigations in Kosovo.

### E: Mechanism of injuries

All those who died had been ejected from the coach. The survivors, all seated further back, were not in the direct path of the blast and none of them was ejected.

Injuries were caused by blast effects and decelerational forces.

**Blast injuries** were identifiable (29-30) as:

i. *Primary injuries* (due to interaction of the blast wave with the body, primarily affecting gas-filled structures such as ears, lungs and gastrointestinal tract). The tension pneumothorax in Patient 1, unaccompanied by rib fractures or penetrating trauma, is characteristic of severe primary blast injury (21,31), and indicated the need for early evacuation to definitive ITU care.

ii. *Secondary injuries* (penetrating and blunt trauma caused by energised fragments impacting on casualties). The bodily disruption of the dead and the wounds in Patients 2 and 4 were consistent with this mechanism.

iii. *Tertiary injuries* (due to displacement of the body or its limbs by the blast wind). This mechanism accounted for the traumatic amputations.

iv. *Quaternary injuries*. Two of the dead had severe leg burns; many survivors had corneal abrasions and facial flash burns.

### Decelerational injuries

The complex decelerational forces arising in this incident were analogous to those in survivable helicopter crashes (32-33).

*Horizontal deceleration forces* (generated by sudden forward movement when the coach impacted with the ground, followed by abrupt cessation of movement when the unrestrained casualties impacted on seat backs) predispose to head, cervical and upper thoracic injuries (seen in Patients 3,4,6,8,11,17,18 and 21).

*Vertical deceleration forces* (generated when the coach abruptly upended and then dropped to the ground) predispose to thoraco-lumbar fractures in upright, seated occupants (seen in Patients 8,15 and 19), and probably caused the pelvic fractures in Patients 1,3 and 9.

### Traumatic amputations

The severity of injuries in the dead who had traumatic amputations and the lack of amputations in survivors reinforces evidence from other explosions (9,29,34) that casualties close enough to an explosion to suffer amputation are unlikely to survive the blast wave. Conversely, survivors from explosions are highly unlikely to have traumatic amputations, and if they have amputations they will usually have other

critical injuries, with at least 10% chance of dying (9).

### F: Where can we do better?

An uncorroborated report from Serbia on 10 April indicated one patient died after transfer. If so, was this death preventable?

The management of the four most severely injured patients (ISS > 15) in this major incident was compared against 32 predetermined standards of care for individual trauma cases (**'performance indicators'**), previously used at MDHU Frimley Park Hospital and 22 Field Hospital in Kosovo in 1999 (35-36). Areas of concern were:

- **Pre-hospital care.** There was no pre-hospital triage labelling or documentation of casualties. Casualties arrived at hospital with no record of their vital signs or of their treatment at the scene. All Role 1 operational units should be equipped with the approved DMS triage cards. These have NATO Stock Numbers for packs of 5 cards (for individuals) and 20 cards (for operational ambulances).

- **Resuscitation.** There was a significant delay in surgical resuscitation of Patient 2. Some delay is inevitable in a major incident, but lack of communication with the scene caused unnecessary delay in instituting definitive care when she was still non-critical.

- **Definitive care.** Patient 2's core temperature had dropped below 32C before the operation was terminated. Surgical and anaesthetic staff should remain alert to the danger of patients entering the "bloody vicious cycle" of profound hypothermia, coagulopathy and metabolic acidosis.

- **Documentation.** P1 casualties had their treatment at least partially documented on Tudor® Trauma charts. Most P2 and P3 patients were poorly documented. Standardised trauma charts should be used for all P1 and P2 casualties in field hospitals. Clinicians must pay more attention to the supervision and completion of documentation.

### Communications

Communications have consistently been identified as the major failing in major incidents (1). This incident might even have been prevented were it not for "a failure in basic communication" (37)

**Between scene and hospital.** The critical failing was that the medical incident officer could not communicate directly with either hospital. It is essential for the hospital clinical co-ordinator to receive timely information, such as a patient requiring urgent chest drainage is en route by helicopter. He also needs to know the approximate number and nature of casualties and their probable time of arrival in order to make best use of key resources during this reception phase (2,14,17,38).

**Medical Incident Officers should have direct communication links to receiving hospitals.**

It is equally important to know no more casualties are expected, so definitive care can commence. The clinical co-ordinator at Reynolds did not know the scene had been cleared of casualties until the IRT anaesthetist returned 65 minutes after the last casualty left the scene. This seriously delayed surgery on Patient 2.

**Between military and civilian medical services.** There was excellent co-operation between Serbian and KFOR medical personnel during this incident. There had been limited contact beforehand, and this delayed the transfer of patients. Transfer was finally initiated when a local doctor used his mobile telephone from Reynolds to contact a colleague in Mitrovica. The need for combined civilian and military major incident planning is not always appreciated on operations, or even in the UK (39).

**There should be combined major incident planning and liaison between civilian and military medical units before incidents.**

### Conclusion

This incident has been analysed in detail to augment the “institutional military medical memory” that is so much at risk with the closure of the UK’s military hospitals and the dispersal of military clinicians into civilian practice (40).

It was successfully managed using the MIMMS approach and BATLS protocols. The main failing was poor communication. The combined response by British and American military medical personnel in particular augured well for the amalgamation of Reynolds and Bondsteel Hospitals, and for future combined operations.

### Postscript

Four people suspected of causing the bombing were detained in March 2001, but the chief suspect (Florim Ejupi) escaped in May 2001 under bizarre circumstances (37) and the other three were released in December 2001 for want of evidence (41). Florim Ejupi was arrested in Tirana at UNMIK Police request on 7 June 2004 and awaits trial (42).

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