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## **Earthquake relief experience of Aga Khan University trauma team**

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### **Background**

The volatile geo-political situation of the country after the events of September 11, compelled the department of Surgery at Aga Khan University (AKU) to initiate the formation of a comprehensive disaster plan and trauma team. Since its inception the trauma team has stood the test of time during multiple disaster situations in Karachi. This includes the bus bombing of the French engineers, Hyderi mosque bomb blast and various other bomb blasts inside the city of Karachi. All these disasters were successfully managed within the premises of AKU. This earthquake relief activity was the first of its kind when the AKU trauma team ventured out and performed brilliantly, yet again, in a totally foreign environment.

### **Preparation**

The magnitude and impact of the disaster shook the whole nation. Everybody wanted to contribute. A top management meeting early on Monday (October 10th, 2005) morning gave a go-ahead to our trauma team and issued directives to all concerned departments to mobilize the required resources. A generous financial sum was immediately allocated by the university to support this cause. Dr. Hasnain Zafar was given the charge to lead a team of 12 volunteers. There were 2 general surgeons, one orthopaedic surgeon, one neurosurgeon, one anaesthetist and one emergency specialist. The support staff included general surgery and orthopedic residents and specialty technicians belonging to the operating room, surgical and orthopaedic clinics. At least 65 cartons of various antibiotics, plaster of Paris, intravenous fluids, sutures, dressing bandages, antiseptic solutions, life saving drugs, and tetanus vaccines were immediately made available within the same evening. This also included a laparotomy set, amputation equipment, intramedullary nails and external fixators. Besides, the team was provided with tents, sleeping bags, and mattresses, making them ready to function in a field.

### **Deployment**

After six hours of waiting at the Chaklala airport, we were finally requested by the army to base ourselves at the Kahuta Research Laboratory (KRL) Hospital, Islamabad. Senior personnel in the army and Dr Kamran Majeed, director KRL Hospital, were able to convince us that such a specialized team would be most productive in a hospital setting rather than in any field capacity. It was at 11pm on 12th October that we were received by Dr. Kamran at the KRL hospital.

### **Operation**

Few earthquake victims (EQV) were already admitted a day before our arrival. Our first surgical case was an adolescent boy with fracture of both femurs. Surgery started at full pace with sometimes four parallel theaters running. Almost 95% of these were orthopaedic cases and our intramedullary nails proved very useful. Running parallel to the main theaters was the all important minor theater where all the cases of dressings were being handled by our other team members. Our census in the first three weeks remained around 12-15 major cases per day and about 25 cases of dressings per day. All the medicines, equipment and plaster that we had brought in were being fully utilized. These were real tough days with the total census of EQVs reaching to as high as 90 for few days. Ten to fifteen patients were being admitted daily and soon the hospital was looking for a suitable place to act as a step-down unit whereby stable patients could be transferred. Initially 'Sehar' and later 'Sheltar' proved very useful and allowed us to transfer our stable postoperative patients there. Daily work started at 0830 and sometimes it was well past midnight that we finished our evening rounds of the patients in these step-down units. But team spirit remained very high and nobody ever looked exhausted. We dealt with all kind of patients; male, female, children and elderly. Our aim was to get them on their feet at the earliest. A wide

spectrum of orthopaedic injuries was being admitted daily. After the first ten days the spectrum of acute injuries started changing. Even closed fractures were difficult to reduce and almost all of them required open reduction and lot of struggle. Within the second week we admitted patients who had open wounds and had now become infected. This required multiple, meticulous wound toilets, sometimes for many days under general anaesthesia, before the wound could be managed in the minor theater by the dressing team. The pair of operating room C-arm proved very useful and we did as high as seven cases of intra-medullary nailing per day.

We also visited other hospitals of the city and collected numerous patients from there which we thought could benefit from our specialized expertise. By the second week, we had brought in our full equipment of Ilizarov apparatus and were applying it regularly to our patients. Also by this time an expertise in local soft tissue coverage came in and thereafter we regularly performed local flaps in patients who so required. This combination of applying Ilizarov apparatus and soft tissue coverage procedure with a local flap helped us save many limbs with bad infections that were otherwise destined to be amputated. We only did one amputation out of a total of more than 500 surgeries performed over the last 8 weeks.

#### Statistics:

* Total duration of stay	53 days
* No of cases (GA)	519
* No of dressings (Sedative or ketamine)	840
* Orthopedic	509
* Spine	7
* General surgical	3
* Laparotomy	2
* Diverting colostomy	1
<b>* Fracture femur</b>	<b>51</b>
* K nail	34
* Interlocking nail	8
* NA fixator	2
* Ilizarov	2+4
* Spica	1
<b>* Fracture tibia</b>	<b>34</b>
* POP cast	25
* Interlocking nail	3
* Ilizarov	16
<b>* Upper limb</b>	<b>38</b>

* Humerus	
* Rush nail	12
* ORIF	3
* Forearm	9
* Fracture dislocation shoulder	1
* Distal radius fracture	4
* Metacarpal /phalanges	9
<b>* Ilizarov</b>	<b>28</b>
* Ankle fusion	4
* Tibial plate	2
* Tibial plate	2
* Comm./segmental tibia	9
* Segment transport	3
* Femur shaft	6
* Distal femur	2
<b>* Flaps for lower limb soft tissue coverage</b>	<b>18</b>
* Sural artery	5
* Peroneal island	1
* Posterior tibial	3
* Supra - malleolar	3
* Fascio-cutaneous, random	6
<b>* Flaps for upper limb soft tissue coverage</b>	<b>14</b>
- Fillet flap	4
- Dorsal flap for 1st web	3
- PIA flap	3
- Chinese flap	1
- Cross finger flap	2
- Moberg	1

#### Miscellaneous

- Lisfranc joint dislocation	5
- Fracture neck of femur (paeds)	5
- Pelvis (APC II)	2
- Rubber band technique for open soft tissue defects	30
- Split Skin grafts	67
- Wound debridement (GA)	230

#### Team dynamics

- Regular replacements after first week.

<b>Total personnel involved</b>	<b>52</b>
- Orthopaedic surgeons	2
- General surgeons	4
- Anaesthetists	6
- Ortho Residents	6
- Gen. Surg. Residents	9

- OT Techs.	4
- Plaster techs	3
- Dressing techs	3
- Nurse	1
- Physiotherapists	3
- Medical students	5
- Miscellaneous	6
- Orthopaedic surgeons	2
- General surgeons	4
- Anaesthetists	6
- Ortho Residents	6
- Gen. Surg. Residents	9
- OT Techs.	4
- Plaster techs	3
- Dressing techs	3
- Nurse	1
- Physiotherapists	3
- Medical students	5
- Miscellaneous	6

### Team working

Morning round	Chief res. GS
- Operating rooms	12 hours
- 4 parallel theaters	3 weeks
- 2 parallel theaters	5 weeks
- Run by Ortho. Surgeon, ortho. resident and General Surgeon.	
- Minor OT (dressings)	
GS/Ortho resident	6-8 hours
- Evening round	4 hours
- Working hours /day	16 - 18 hrs

### AKU Disaster Teams

Realizing the demand of work and expertise, Aga Khan University arranged multiple teams to cater for the needy patients:

1. Trauma team
2. Paediatric and Gynae team
  - Mass vaccination
  - Obstetric services
  - Dressings and splints
3. Medical team
  - General medicine
  - Dressings, splint
4. Nursing team
5. Community health sciences team
  - Assess impact of damage
  - Gather data about missing social and health facilities

6. Psychiatric team
  - Psychological help
  - Trained volunteers

### Exit

Our first major team replacement came at the time of the long Eid weekend. The team strength was reduced to 5 but they continued to perform brilliantly despite being away from their families on Eid day. It was at that time decided by AKU that a sudden exit of the trauma team would not be beneficial for the post-operative patients. Orthopedic patients usually require a longer follow-up until they are totally free of problems and their wounds and bones heal. The operation was thereafter re-started after Eid and this time we brought in a couple of physiotherapists who helped us mobilize these patients at the earliest. All this great time has passed very soon and we finally closed at about eight weeks with a plan to do regular bimonthly follow-up of our patients that are still at KRL Hospital.

### Conclusion

Overall this was a very gratifying experience where for the first time a lot of us coming from a private hospital performed in a charitable situation and helped the needy totally free of cost. A total of 52 people rotated in our team at different points in time and all of them were very happy to have played their part and were extremely thankful of the excellent KRL hospitality. This experience would, I am sure, go a long way in building institutional linkages between AKU and KRL hospital.

### Lessons learnt

An early start of the rescue operation could have saved many lives.

Triage of patients from disaster zone must be done by professionals of multiple teams themselves. Being away from the disaster zone our team missed this opportunity. This made our expert general surgeons almost redundant as they were mostly busy doing orthopaedic surgeries. A better control over triage would have enabled us to divert thoracic and abdominal injury patients to our trauma team.

Transfer of patients to other bigger cities of the same province or country should parallel the evacuation process.

There were many patients with spinal injuries. Their total number may run in thousands. Almost all of them required surgical care. As spine surgery service was scarcely available in the town (including our team) these paraplegic patients were the most neglected of all. We saw a lot of them in shelter places with other post-operative patients. They were suffering badly because of lack of proper surgical and nursing care. All trauma teams must

develop manpower expertise in spine surgery.

The number of lower or upper limb amputees was a greater burden. As a country we lack good orthotic and prosthetic industry. Whatever we have, probably could not cater for this heavy load. This deficiency was highlighted during this disaster management.

The trauma team has to be lead by example; there must always be a team leader who is available all the time and is putting up the maximum by his own personal work schedule. This keeps the whole team motivated and prevents discouragement among team members. The leadership must also be replaced regularly. Potential future team leaders should be identified in peace times.

A strong organizing team back home forms the backbone of any trauma team which ventures out in the disaster zone. This permanent team of managers based within the index institute facilitates all the requirements of the trauma team. Regular communication facility with the main organizers back home is a major requirement. This facilitates monitoring and placement of new orders for medicines and implants, and manpower replacement.

Regular replacement of all members of the team is very essential. The work load is usually enormous and fatigue sets in early. A biweekly rota should be made by the organizers for regular replacement. People should never be forced to join this activity.

All trauma teams must leave with full surgical equipment relevant to their manpower expertise. Things as simple as a drill machine to perform orthopedic surgeries may be difficult to find in a new environment. A permanent resource of relevant implant sets must be developed. This may include a Laparotomy set, amputation set, and external fixation set. Depending on the circumstances and working conditions of the team other sets of instruments can be called for from the primary institution. This was highlighted when our team brought in the Ilizarov instruments and implants in the third week of the earthquake. This helped us save many limbs subsequently.

The hard voluntary work done by any team must be generously rewarded at either the institutional or national level by respective organizations.

## **Future**

Unfortunately natural disasters cannot be predicted. Warnings systems may also not work. We need to plan carefully for the future. This can be done at multiple levels:

### **Individual level**

We need to identify specialists in the field of disaster management. They will be volunteers who have an interest in trauma management and have preferably done some

trauma training/courses. This cohort of specialists will include general surgeons, orthopaedic surgeons, neurosurgeons, spine surgeons, plastic surgeons, physicians, psychiatrists, anaesthetists and emergency medicine specialists. These specialists will enroll themselves in a national trauma personnel registry and will also mention the time frame they can volunteer themselves for. It will be essential for them to be prepared for working in a setting of a field hospital and live and sleep outdoors. A previous outdoor adventure experience will be an advantage. The minimum time duration for such voluntary work should be 2 weeks.

### **Individual hospitals**

Each tertiary level hospital, public or private, interested in participation should declare its commitment to national disaster management. All hospitals need to formulate their disaster plans and work towards developing necessary manpower and logistic resources for its immediate implementation. As a first step each department in the hospital should write in black and white its own indigenous plan for disaster management. Plans from surgical departments, anaesthesia and the operating room are of paramount importance. This may call for suspension of all elective surgical cases for few weeks. Reports from each department should then be combined into a hospital-wide action plan. This should include the number of patients any hospital can accommodate in a disaster setting and the number of beds it can make available while still providing and maintaining quality care. As happened in this recent scenario, putting patients on 'charpais' in hospital corridors and halls should not be equated as providing disaster care. The disaster plan should also include how the various support services of the hospital will be integrated at a very short notice. Details of the command structure, resources at hand and in storage, and regular disaster drills should be a part of each hospital's disaster plan.

### **City level**

All hospitals interested in admitting disaster patients should then merge their individual disaster plans into a comprehensive city-wide disaster plan for each major city. Once this is done, it would be known to everybody that city 'A' can cater for 'x' number of patients and so on. A disaster can strike at any place in the country, but this knowledge would help us know the finite limits of a city and help the authorities in early dissemination of sick patients to adjacent bigger towns. This phenomenon of transfer to other cities did happen in the recent earthquake but, in our opinion, too late in the process. Patients were not shifted to cities other than Pindi, until all hospitals in Pindi were overflowing and exhausted with manpower and other

resources. Ideally these patients should have been flown out right from Neelum Stadium Muzzaffarbad to other major cities of Lahore, Multan, Faisalabad, and Karachi, to provide timely comprehensive care. That could also have avoided every specialist running up north to help out and most of them finding little opportunity to contribute, leading to frustration and early fatigue.

### **Pakistan Orthopaedic Association (POA) Level**

Ninety-five percent of the patients in the recent earthquake had orthopaedic injuries. This could amount to >70,000 patients. The importance of organizing the orthopaedic community cannot be over-emphasized. All of these 70,000 patients required immediate, specialized and sustained orthopaedic care. The POA leadership should immediately activate its members from a unified forum and act as a central liaising body in the whole affair. A list of volunteers should already be known to them. POA has a great role to play in all of the following activities:

1. Triage
2. Deployment
3. Provision of implants and instruments
4. Manpower re-enforcements.

Capacity building for future emergency situations should now be a top agenda. An immediate national level meeting of the heads of institution should be called to agree upon the plan of action. This should include facilitating the development and training of manpower resources in disaster management. A database should be formed about the actual number of individual fractures. The analysis of this database would give us the rationale to procure the approximate number of implants, external fixator, and POP. Understanding should be reached with all implant vendors about the procurement of these implants as well as instruments required for such operations at the lowest possible cost. This would form the permanent resource of POA which will be made available to disaster teams within the first 24 hours of the declaration of emergency. Funds would need to be generated for this purpose. The POA members and philanthropists and international donor agencies should be contacted for fundraising.

All volunteers should be hooked to a POA disaster website, whereby they can continuously keep themselves aware of whatever is happening. Unless we plan and build now, it will be very difficult to plan during a future emergency.

Triage has to be done in combination with a general surgeon and a emergency physician. POA representation in filed triage is essential. That will be the anchor place for dissemination of patients, data about their severity of injury, their volume and the emergency services provided.

POA would have complete knowledge of the location of its volunteers. It should also have complete knowledge of the hospitals and health facilities in the towns close to the disaster area. This would enable them to deploy teams of volunteers. If adequate health facilities are not available then long-distance transfer of patients to bigger towns should be recommended. That will decrease the influx of health care volunteers who usually want to participate in large numbers but cannot find a suitable workplace to perform specialized work.

As soon as patients start to flow in, the POA central secretariat should immediately dispatch the implants and instruments from its warehouse to the places in its greatest need in order of priority.

Manpower fatigue is another issue that crops up within the first week of declaration of emergency. The workload is immense and work never finishes. Rest is scarcely available and everybody wants to put in his/her maximum. This requires regular re-enforcement of the manpower with fresh blood. Nobody should be allowed to stretch themselves beyond two weeks of continuous work.

### **Role of Postgraduates**

Our postgraduates can play a huge role in an emergency situation. In fact they would form the backbone of any disaster team. A list of voluntary postgraduates should be available to the POA. These can be deployed at important hospitals busy in emergency work.

**Web-site:** Immediate and efficient communication can be achieved by creating a web page for all disaster related activities.

### **National Level**

The public and private sector along with the army should formulate a national disaster policy. The blueprint of field hospitals and triage has to be developed in black and white at the national level. Manpower has to be identified to be able to do triage and run field hospitals in any future disaster. Concrete plans to channel out the injured patients have to be identified.