DISASTER PLANNING:

When Disaster Strikes, Will We Be Ready?

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BEFORE DISASTER

Personal measures

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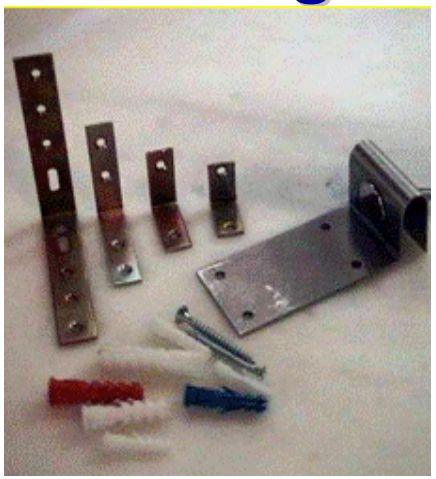
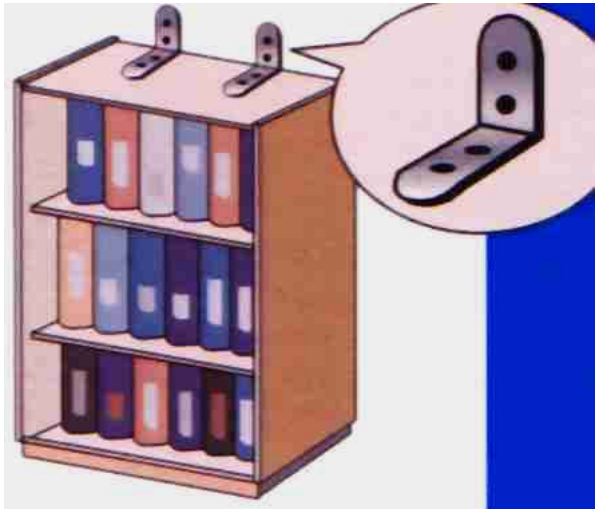
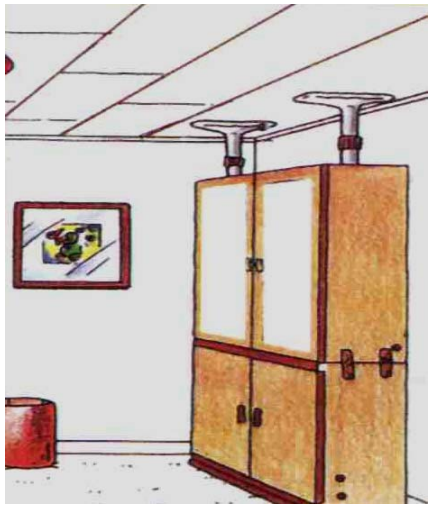
BEFORE DISASTER

Personal measures

- Fixing furnitures to the walls







- Cupboards
- Wardrobes
- Bookcases
- TV's
- Air conditioners

Shoaf et al., 1998

Sever, 2005

BEFORE DISASTER

Institutional measures

- Educational activities
- Planning of:
  - medical personnel
  - medical items stock
  - dialysis services
    - acute patients
    - chronic patients
- Preparing an action plan

BEFORE DISASTER

Institutional measures

- **Educational activities**
  - Medical personnel (Doctors, nurses, technicians)
  - Rescue team members
  - Public
  - Dialysis patients

IMPORTANCE of EDUCATIONAL ACTIVITIES

Marmara E.: 10% of the patients were receiving K^+ containing solutions on admission to hospitals

This was certainly a malpractice !

Killed many patients who would survive !

K+ containing solutions should NEVER be administered empirically !

~~KADALEX~~ ~~ISOLYTE~~ ~~ISOLYTE-M~~

Sever et al, NDT 2002

BEFORE DISASTER

Institutional measures

- **Educational activities**
  - Medical personnel (Doctors, nurses, technicians)
  - Rescue team members
  - Public
  - Chronic dialysis patients

BEFORE DISASTER

Institutional measures

- **Educational activities**
  - Medical personnel (Doctors, nurses, technicians)
  - Rescue team members and paramedics
  - Public
  - Chronic dialysis patients

EDUCATION OF CHRONIC DIALYSIS PATIENTS

WHAT TO DO: BEFORE ------ DURING ------ AFTER DISASTER

DEPREMLER
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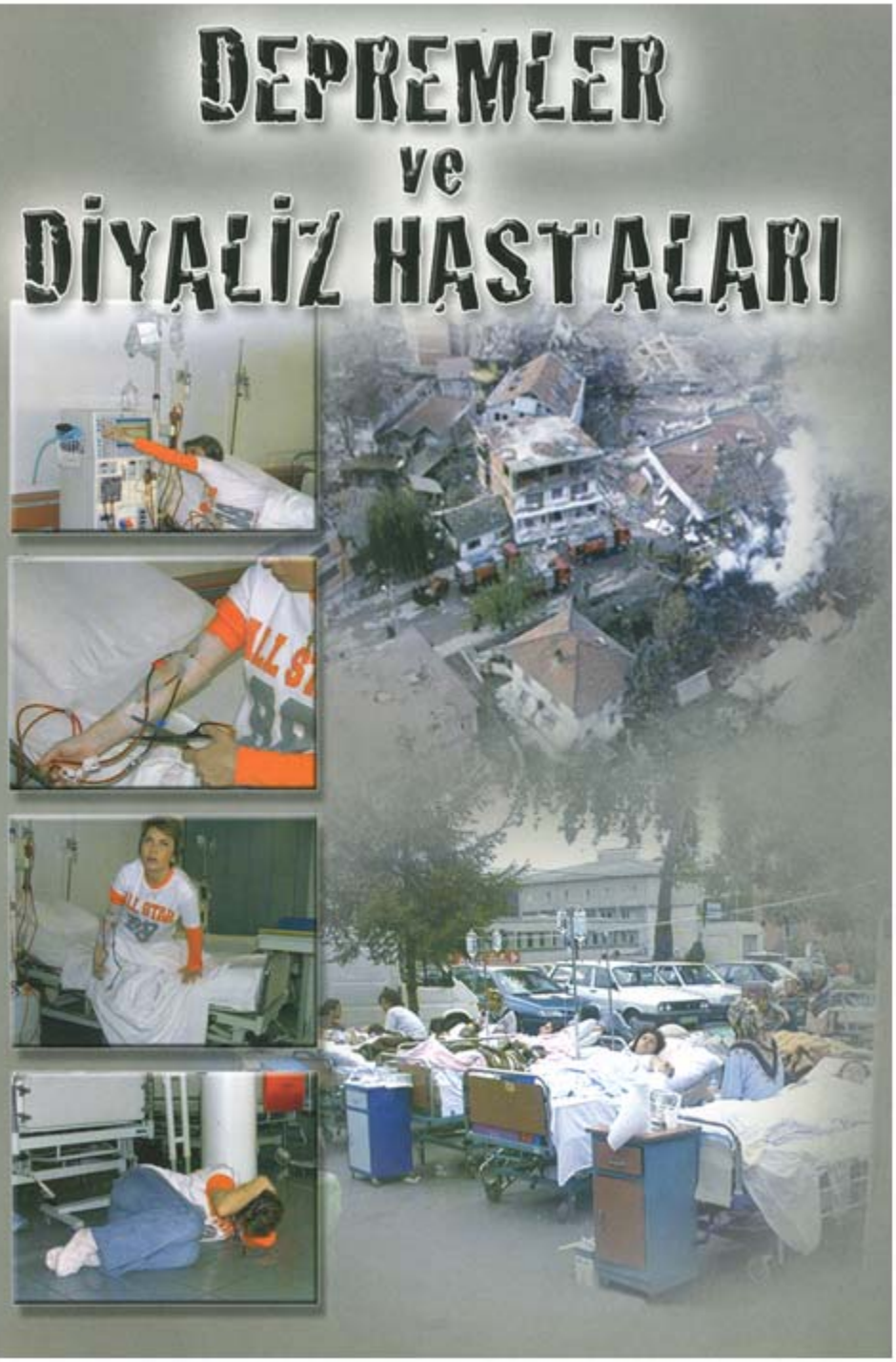
DİYALİZ HASTALARI



BEFORE DISASTER

Institutional measures

- Educational activities
- Planning of:
  - medical personnel
  - medical items stock
  - dialysis services
    - acute patients
    - chronic patients

RENAL REPLACEMENT THERAPY DURING DISASTERS - I

Intermittent Hemodialysis:

Advantages:

- High clearence rate, dialysis without anticoagulation
- Possibility to treat several pts./day at the same position

Disadvantages:

- Complicated, risk of disequilibrium syndrome
- Need for: experienced personnel, electricity and water supplies.

..was applied to 462 pts. (overall 5137 extra sessions) during the Marmara Disaster

Collins, Crit Care Clin,1991; Solez et al, KI, 1993; Vanholder et al, KI, 2000; Sever et al, KI, 2002

SORBENT (REDY) DIALYSIS in DISASTERS

- Dialysate regeneration
- 6 lit. dialysate
- Logistic advantage
- Limited experience after mass disasters

Armenian earthquake:

- Easy transportation, simplicity, min. dialysate need
- Insufficient clearance in crush patients
- Very expensive

Tattersall et al., Injury 1990

RENAL REPLACEMENT THERAPY DURING DISASTERS - II

Slow Continuous Therapy

Advantages:

- More gradual removal of solutes and fluid
- Can be established rapidly

Disadvantages:

- Low clearence rate, can only be applied to one patient per position / machine
- Need for experienced personnel, electricity and excessive amounts of substitution fluid

..was applied to 34 pts. during the Marmara Disaster

Collins, Crit Care Clin,1991; Solez et al, KI, 1993; Vanholder et al, KI, 2000; Sever et al, KI, 2002

RENAL REPLACEMENT THERAPY DURING DISASTERS -III

Peritoneal Dialysis

Advantages:

- Simple, independent of power and tap water
- Initiated rapidly, no risk of disequilibrium synd.

Disadvantages:

- Difficult in pts. with abdominal / thoracic trauma
- Need for large quantities of dialysate
- Nonhygienic field conditions.

..was applied to 8 pts. during the Marmara Disaster

Collins, Crit Care Clin,1991; Solez et al, KI, 1993; Vanholder et al, KI, 2000; Sever et al, KI, 2002

BEFORE DISASTER

Institutional measures

- Educational activities
- Planning of:
  - medical personnel
  - medical items stock
  - dialysis services
    - acute patients
    - chronic patients

J Am Soc Nephrol 15: 1071–1076, 2004

Features of Chronic Hemodialysis Practice after the Marmara Earthquake

JASN 2004; 15: 1071

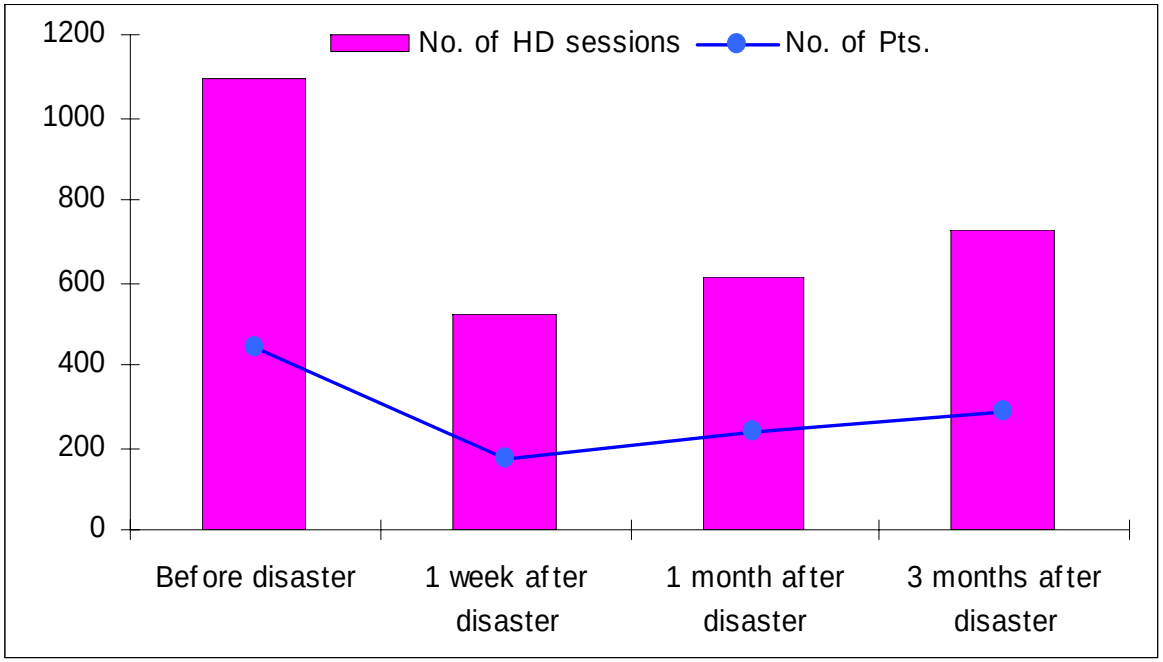
MEHMET SUKRU SEVER,* EKREM EREK,† RAYMOND VANHOLDER,‡

	Before disaster*	> 1 month disaster	> 3 months disaster
HD centers	12	8	8
HD machines	95	74	79
HD doctors	22	17	20
HD nurses	57	45	46
HD Technicians	33	24	28
Total	112	86	94

THE FATE of CHRONIC DIALYSIS PATIENTS AFTER THE MARMARA EARTHQUAKE - II

356 chr. HD patients; 212 male; age: 47±15 yrs.

No. of hemodialysis sessions and patients

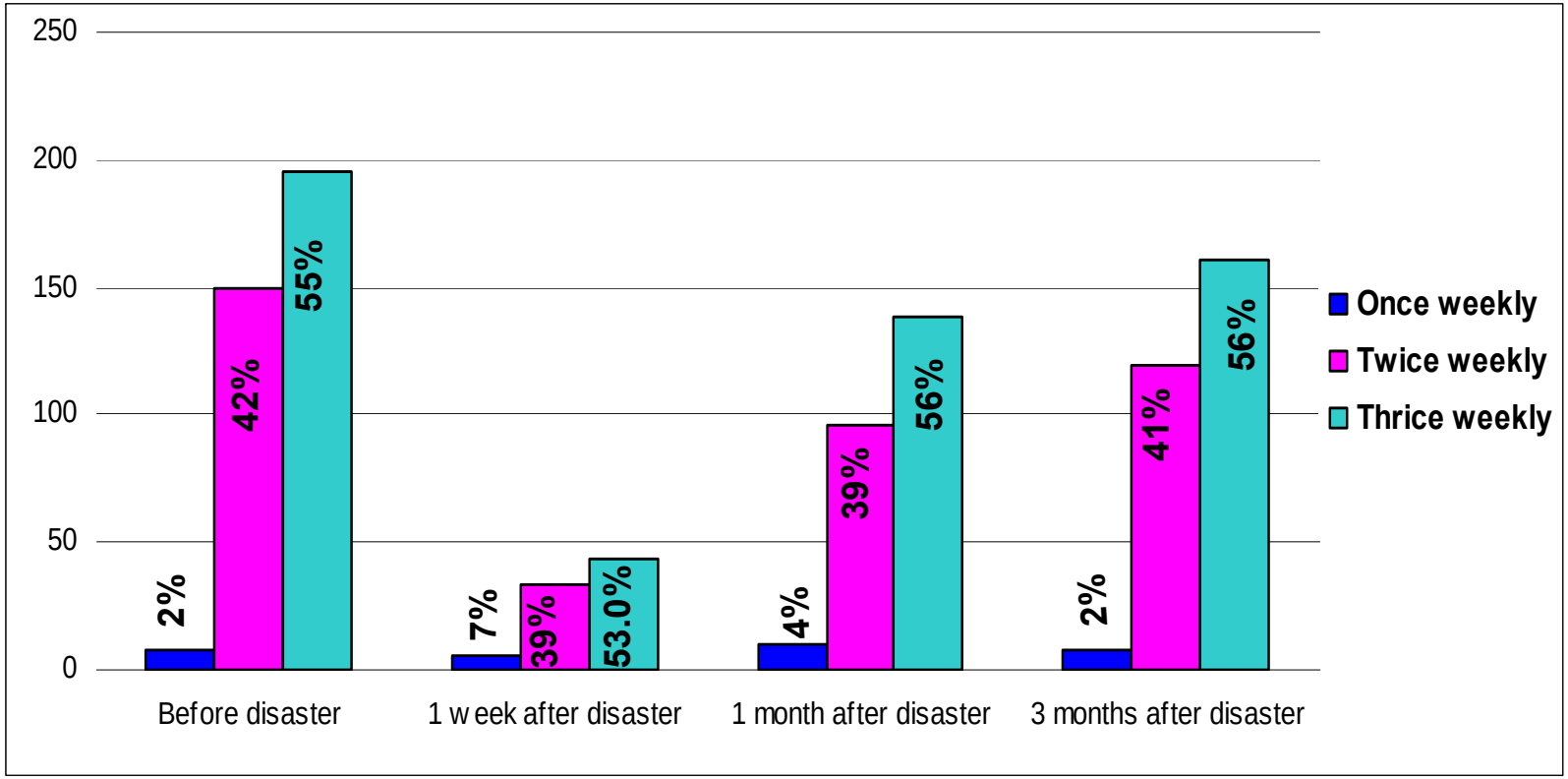


(p=0.04 for both analyses)

Sever et al, JASN, 2004

THE FATE of CHRONIC DIALYSIS PATIENTS AFTER THE MARMARA EARTHQUAKE - III

FREQUENCY OF HEMODIALYSIS SESSIONS

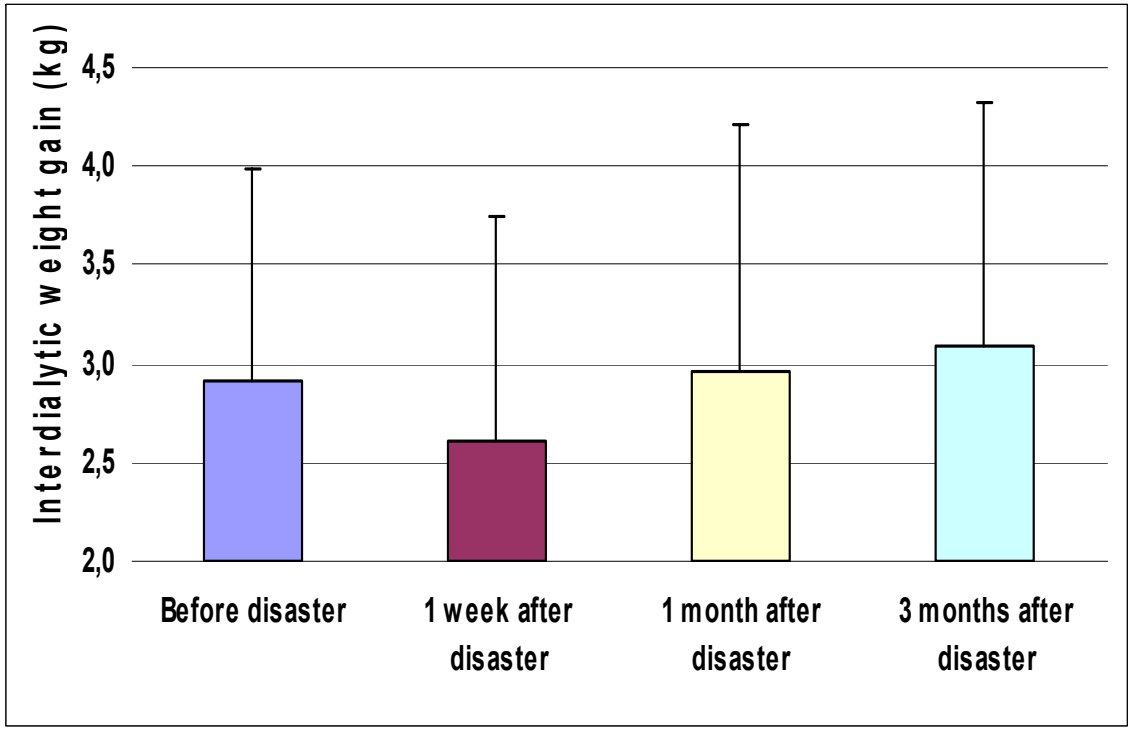


Sever et al, JASN, 2004

THE FATE of CHRONIC DIALYSIS PATIENTS AFTER THE MARMARA EARTHQUAKE - IV

INTERDIALYTIC WEIGHT GAIN

Before versus:
+ 1 week: p=0.006
+ 1 month: p=0.72
+ 3 months: p=0.001



SYSTOLIC / DIASTOLIC B.P.

Before vs.
1 week, 1 and 3 months after disaster = NS.

CHRONIC DIALYSIS PATIENTS COMPLY WITH DISASTER CONDITIONS

Sever et al, JASN, 2004

BEFORE DISASTER

Institutional measures

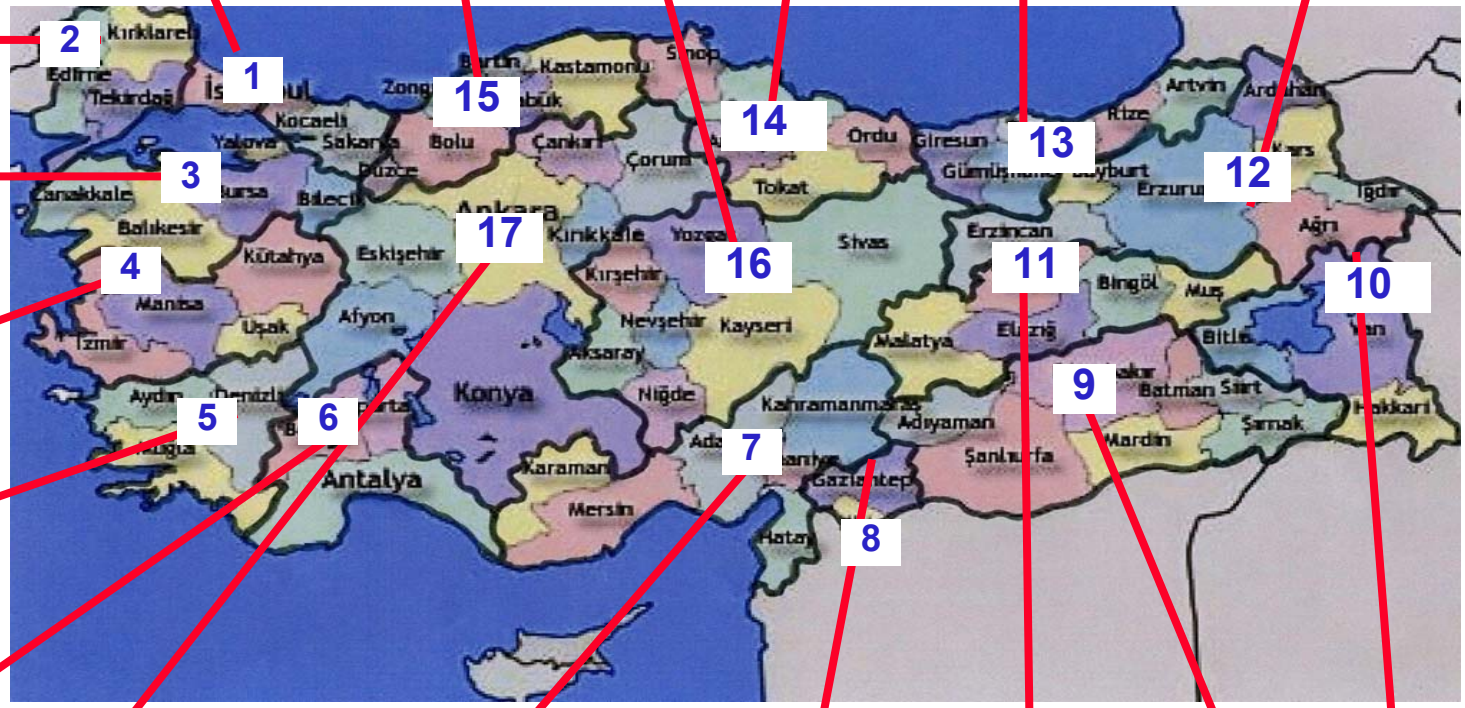
- Educational activities
- Planning of:
  - medical personnel
  - medical items stock
  - dialysis services
    - acute patients
    - chronic patients
- **Preparing an action plan**

ACTION PLAN

- General disaster relief coordinator
- Local coordinators
- Distant coordinator
- Substitutes

- Hyperacute phase
- Acute phase

Earthquake Prone Regions in Turkey / The Relief Coordinators



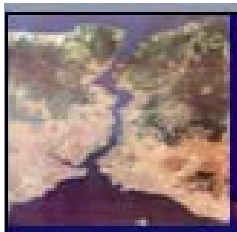
Science, 2000; 288: 661-5.

Heightened Odds of Large Earthquakes Near Istanbul: An Interaction-Based Probability Calculation

Tom Parsons,[1*] Shinji Toda,[2] Ross S. Stein,[1] Aykut Barka,[3] James H. Dieterich[1]

We calculate the probability of strong shaking in Istanbul, an urban center of 10 million people, from the description of earthquakes on the North Anatolian fault system in ... catalog

- **32% in the next 3 years**
- **62% in the next 23 years**



ISTANBUL METROPOLITAN MUNICIPALITY
Measures for Preventing Disaster

Earthquake Scenarios for Determining the Damage

Postulated Earthquake Damages and Post-Event Needs

- Heavily damaged buildings : 50,000 - 60,000
- Homeless: 500,000 - 600,000
- Death toll : 70,000 - 90,000
- 135.000 injured
- 8% of the public facilities (schools, hospitals, etc.) will be heavily damaged
- 20 out of 460 bridges have high possibility of collapse

3000 – 4000 crush syndrome cases

THE DISASTER HAS OCCURED

General Disaster Relief Coordinator: Dr.(1)

Dr.(1) → **Dr.(2)**

- Status of their hospital buildings?
- Status of patient flow to their hospital?
- Briefing and instructions on the action plan

Dr.(1) → **Dr.(3)**

- Briefing and instructions on the action plan

Dr.(1) → **Dr.(4)**

- Contact other disaster relief coordinators
- Get information on how many nephrologists / dialysis nurses can reach the disaster area?
- Get information on how many crush patients can be handled in the hospitals of their region?

Dr.(1) → **Dr.ISN**

- Information on dialysis material support ?
- Information on dialysis personnel support ?

Dr.(1) did not contact anyone during the last 2 hours;
Dr.(2), **Dr.(3)** and **Dr.(4)** could not reach him.

~~Dr.(1) OUT~~
General Disaster Relief Coordinator **Dr.(2)**

Dr.(2) → **Dr.(3)**
Dr.(2) → **Dr.(A)**

- Status of their hospital buildings?
- Status of patient flow to their hospital?
- Briefing and instructions on the action plan

Dr.(2) → **Dr. (4)**

- Contact disaster relief coordinators
- Get information on how many nephrologists / dialysis nurses can reach the disaster area?
- Get information on how many crush patients can be handled in the hospitals of their region?

Dr.(2) → **Dr.ISN**

- Information on dialysis material support ?
- Information on dialysis personnel support ?

Dr.(2) did not contact anyone during the last 2 hours;
Dr.(3) and Dr.(4) could not reach him.

~~Dr.(2) OUT~~

General Disaster Relief Coordinator

Dr.(3)

Dr.(3) → **Dr.(A)**

Dr.(3) → **Dr.(B)**

- Status of their hospital buildings?
- Status of patient flow to their hospital?
- Briefing and instructions on the action plan

Dr.(3) → **Dr. (4)**

- Contact disaster relief coordinators
- Get information on how many nephrologists / dialysis nurses can reach the disaster area?
- Get information on how many crush patients can be handled in the hospitals of their region?

Dr.(3) → **Dr.ISN**

- Information on dialysis material support ?
- Information on dialysis personnel support ?

Dr.(3) did not contact anyone during the last 2 hours;
Dr.(4) could not reach him.

~~Dr.(3) OUT~~

General Disaster Relief Coordinator

Dr.(4)

Dr.(A)

Dr.(B)

- Status of their hospital buildings?
- Status of patient flow to their hospital?
- Briefing and instructions on the action plan

Dr. (4)

- Contact disaster relief coordinators
- Get information on how many nephrologists / dialysis nurses can reach the disaster area?
- Get information on how many crush patients can be handled in the hospitals of their region?

Dr.ISN

- Information on dialysis material support ?
- Information on dialysis personnel support ?

POST-DISASTER CHAOS

Scenarios do NOT take place as smooth as planned

- **Logistic problems**
- **Personal problems**

THE COORDINATOR SHOULD BE:

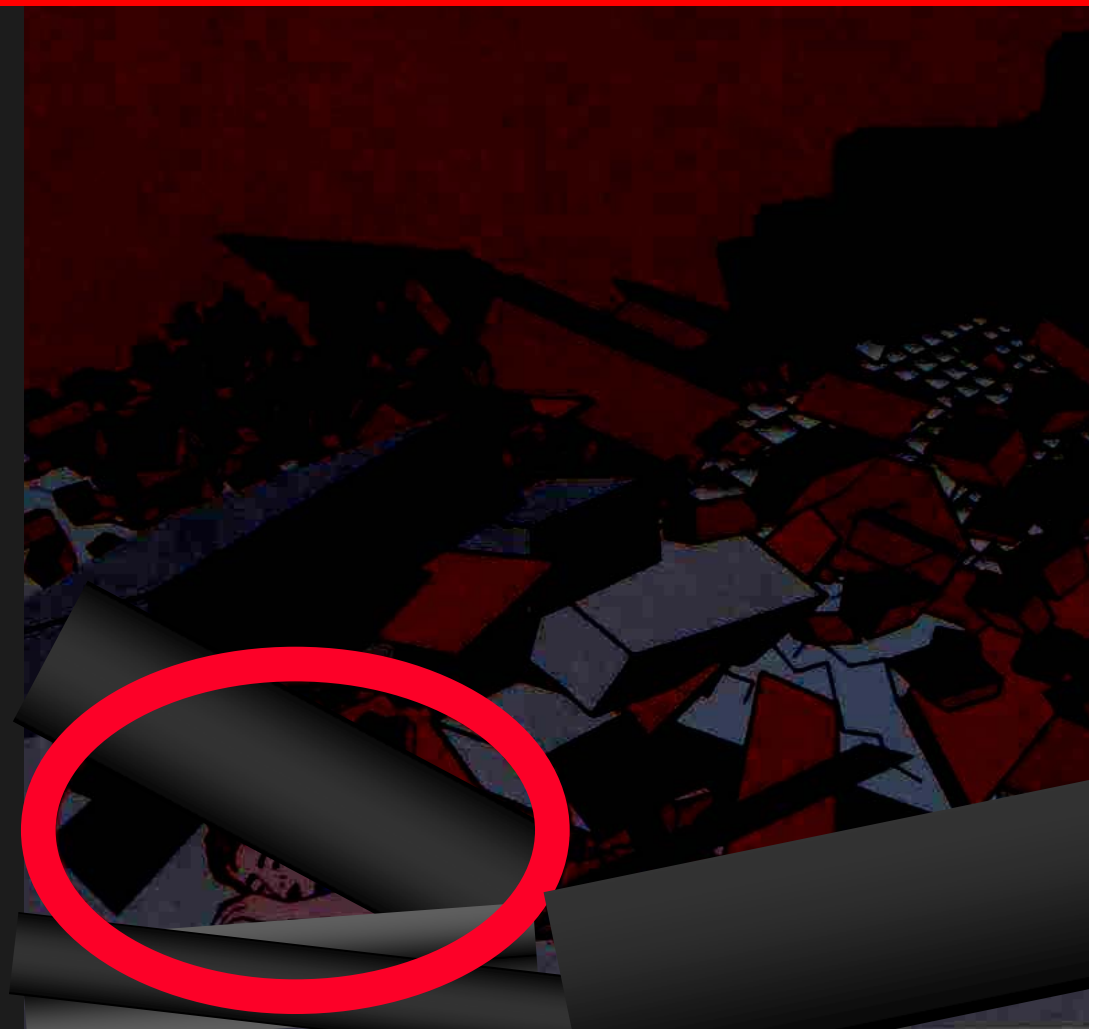
- **Understanding**
- **Tolerant**
- **Patient**

DURING DISASTER

EARLY AFTER DISASTER

IF YOU ARE TRAPPED UNDER THE RUBBLE

- If you can move and see an exit (mostly light) ⇒ try to go there.
- Otherwise stay calm and wait. (Every single muscle movement will spend energy and oxygen).
- Do not shout unless you hear the voice of a person that can rescue you.
- When such a voice is heard, shout and ask for **HELP.**



EARLY AFTER DISASTER

IF YOU HAD ESCAPED :

- **Personal measures**
  (for yourself and your family)
- **Responsibilities**

EARLY AFTER DISASTER

Personal Status

Check your own and family's health status

- **Any personal problems** ⇒ try to solve!
- Do NOT get involved in relief operations!
- Inform coordinating authorities about non-function

- **No personal problems ⇒**
- Make a plan for housing / food for the family
- Start in rescue and medical interventions

RESCUE ACTIVITIES

TIME PERIOD UNDER THE RUBBLE

- **TPR ⇒ critical factor influencing final outcome**
- **Prognosis of entrapped casualties is worse than that of the non-entrapped**

(De Bruycker et al. Int J Epidemiol, 1985; Noji et al., Ann Emerg Med 1990)

- **Mortality is a function of duration of entrapment**

(Noji et al., Int J Epidemiol 1993)

- **Prolonged entrapment delay emergency treatment**

(Sever et al. Crit Care Med 2002)

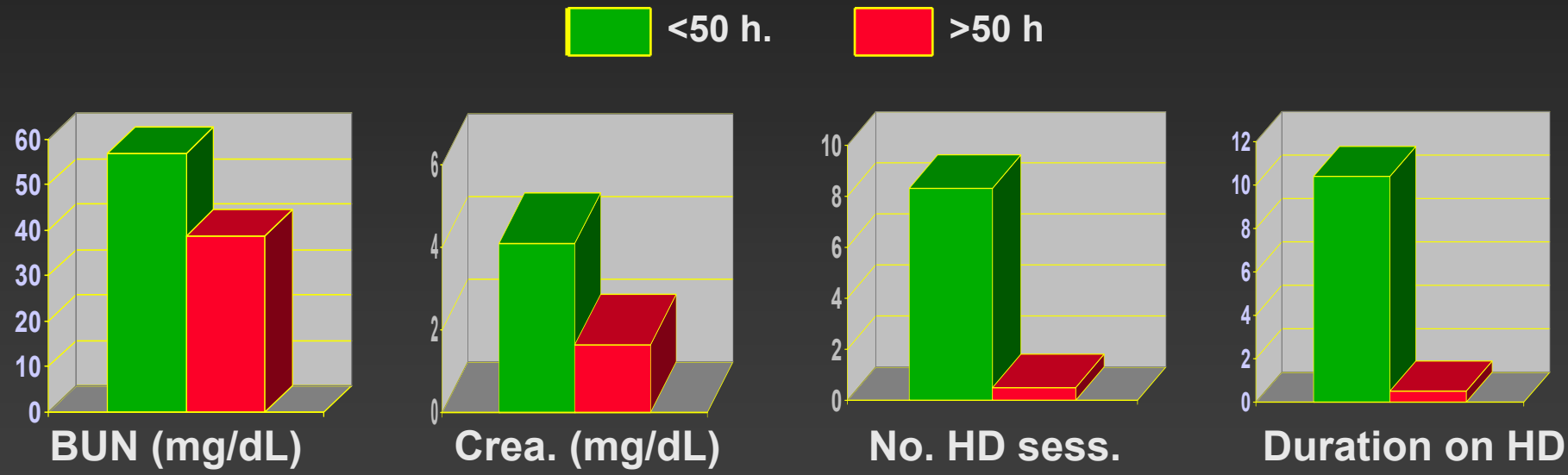
TIME PERIOD UNDER THE RUBBLE

(The Marmara earthquake experience)

Non-survivors vs. survivors: (p=0.26)

Dialyzed: 10±10 hrs.
Not dialyzed: 16±23 hrs.

p<0.001



Only the victims with mild traumas can survive under the rubble for longer periods

Sever et al, Crit Care Med, 2002

FIRST-LINE TREATMENT

FIRST-LINE TREATMENT

Describes:

- ***Interventions at the field / field hospitals***
- ***No lab. opportunity***
- ***Diagnosis / therapy are based on clinical findings***

To prevent renal / systemic complications of crush:

- **Try to find a vein in any of the limbs**
- **Place an iv line; start isotonic saline (1 liter/h)**
- **Continue fluid administration during the rescue**

Immediately After Rescue - I

- **Check the vital signs**
- **Identify type of trauma**
- **Perform a *"primary survey"***

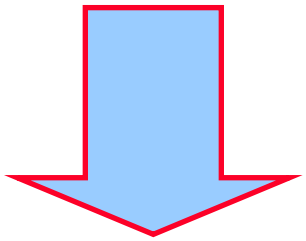
A- *Airway*
B- *Breathing*
C- *Circulation*
D- *Disability*
E- *Exposure*
F- *Foley cath.*
G- *Gastrik cath.*

- **Alert, talking,**
- **Well-oriented,**
- **Moving all extremities**

Routine treatment

Immediately After Rescue - II

- Nonresponsive (~ fatal / mostly penetrating trauma)
  ⇒ treat according to local conditions



- In massive disasters, treat only the cases with ≥ 50% chance of survival (neglect hopeless cases)
- Non-massive disaster ⇒ treat accordingly
- Call help to transport the patients

Pepe and Kvetan, Crit Care Clin 1991

FIELD INTERVENTIONS - TRIAGE

TRIAGE

- Sorting out and classification of casualties /
- Determining priority of need and proper place of treatment

(1) Cases with serious vital risks
(2) Emergency cases without vital risks
(3) Non-emergency cases
(4) Serious cases with no chance of survival
(5) Nonsurvivors

} POTENTIAL CRUSH PTS.

Sever et al, NDT, 2002

Immediately After Rescue -III

Check urine production

- Place a Foley catheter

Oligo-anuric victims

- **Urinary tract trauma ?? Obstruction ??**
- **Hypovolemia ⇒ Compartment syndrome ??**

  ⇒ Bleeding ⇒ STOP (tourniquets, compression bandages; blood, plasma, human albumin transfusion, colloids, saline inf.....)

Immediately After Rescue -IV

Victims with some urine output

(Iv. fluids 1 liter/h.)

- **After rescue ➔ alkaline sol.**
- **Adequate urine response ⇒ +mannitol ➔ 8-12 L/d.**
- **Target urine flow ≥ 300 ml/h.**
- **Less aggressively (4 - 6 L/day) in the elderly**

Other measures

- **Kayexalate**
- **Furosemide**
- **Vasodilator doses of dopamine ??**

CONCLUSIONS

- Disasters can occur at any time; disaster preparedness and scenarios are vital for an effective response.

- All types of RRT carries advantages and disadvantages in disaster crush victims; IHD is the most appropriate modality.

- Education of health care personnel, public, rescue teams and chronic dialysis patients can decrease death toll.

Renal Disaster Relief Task Force of the ISN- CRUSH SYNDROME PATIENTS FOLLOW-UP CHART

Patient Name: Gender: Age: Date of admission:

Date	B.P.	Temp.	Intake	Urine volume	Hct	WBC	Plt.	CK	Crea.	BUN	Na	K	Alb.	HD (yes/no)	OTHER

Renal Disaster Relief Task Force of the ISN - CRUSH SYNDROME PATIENTS QUESTIONNAIRE –I

(Hospital: … … …. … … …)

Case No	DEMOGRAPHY								TRAUMA			
	Name	Age	Gender	Chronic ilness before disaster	City (of origin)	City (where treated)	Date of admission	Time under rubble (hr)	Extremity trauma	Abdominal trauma	Thoracic trauma	Other
1												
2												
3												
4												
5												
6												
7												