



Tıp Fakültesi



Disaster Nephrology: The role of a Renal Disaster Task Force

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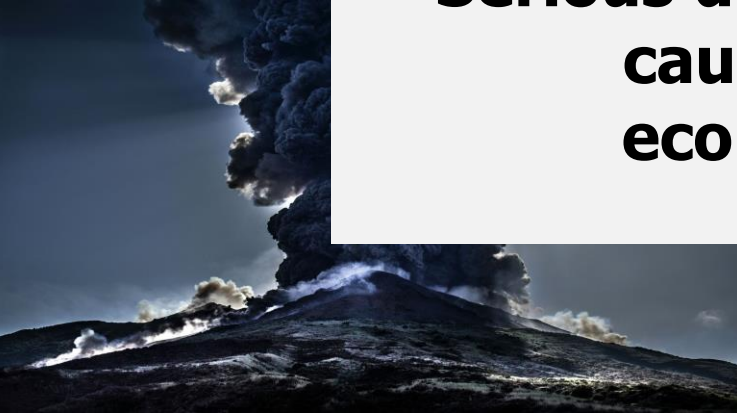
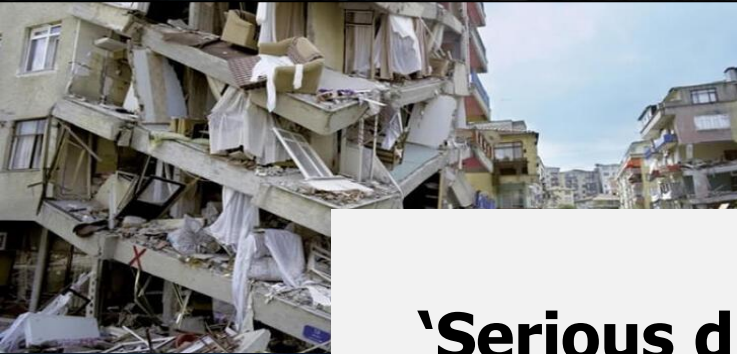
Renal Task Force of *Turkish Society of Nephrology, Chair*

Renal Relief in Disasters Task Force of *ERA, Chair*

Renal Disaster Preparedness WG of ISN, Vice Chair

Geophysical

- Earthquakes
- Volcano explosions



DISASTERS

Climate Associated

Tropical Cyclones
Tornados, hurricanes
Heat Waves
Extreme Cold
Floods



Biological: epidemics



The WHO :
`Serious disruptions of the functioning of a society causing widespread human, material, economical, or environmental losses `



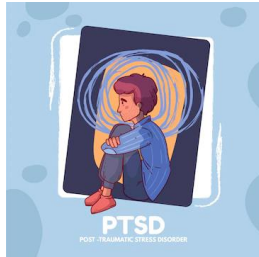
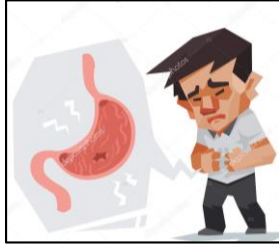
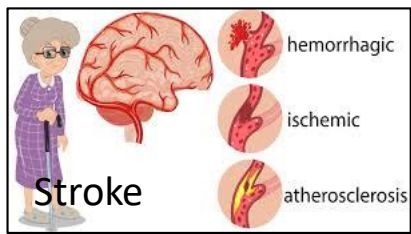
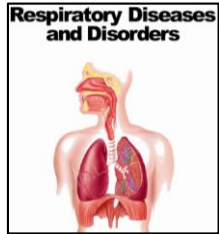
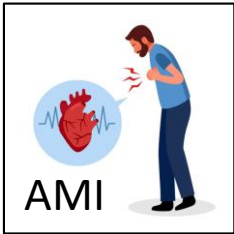
Man-Made

- Hunger
- Pollution
- Industrial disasters
- Fires
- Nuclear accidents
- Wars
- Mass migration



Spectrum of Medical Problems During Disasters (1): Problems Occurring within disaster period

Unrelated to the type of disaster



Related to particular disasters



Wars
Armed conflicts
Terrorist attacks
Hurricanes

Gunshot wounds
Penetrating and blunt traumas



Eathquakes

Crush Syndrome



Tsunamis
Floods

Drowning

Typhoons



Nuclear wars
Accidents
Industrial Accidents

Acute radiation syndrome

Chemical burns

Nephrological Problems at Times of Disasters

- Crush Syndrome
- AKI due to other reasons
- Organization of patients on RRT
 - Hemodialysis
 - Peritoneal Dialysis
 - Renal transplant patients
- Management of patients with CKD, hypertension, GN and others

CRUSH SYNDROME

The Blitz

London bombing during the II. World War



> 40 000 civilians died



Prof. Eric Bywaters
1910-2003

BRITISH MEDICAL JOURNAL

LONDON SATURDAY MARCH 22 1941

CRUSH INJURIES WITH IMPAIRMENT OF RENAL FUNCTION

BY

E. G. L. BYWATERS, M.B., B.S., M.R.C.P.

Beit Memorial Fellow

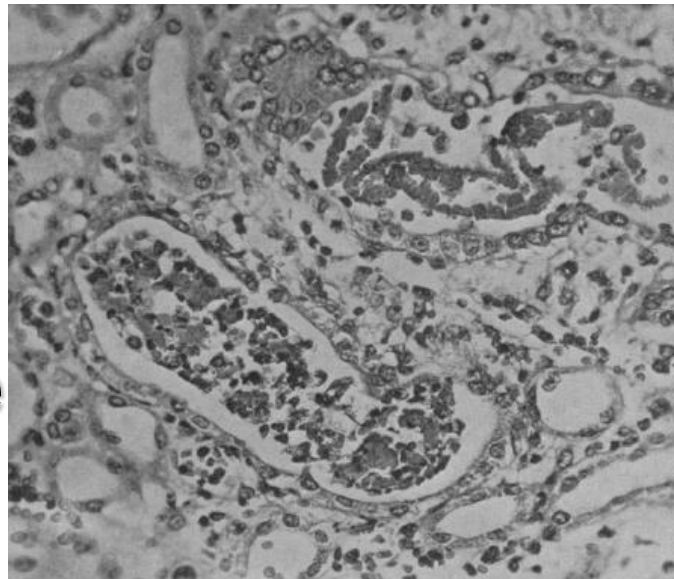
AND

D. BEALL, Ph.D. Toronto

(From the Departments of Medicine and Pathology, British Postgraduate Medical School)

[WITH SPECIAL PLATE]

- 4 cases of Crush Syndrome
- 3 oliguric
- Dark colored Urine
- All died



Conclusion:

Kidney failure caused by
Crush Syndrome frequently
result in death

THE ARMENIAN EARTHQUAKE (1988)

Intensity: 6.8; deaths: 100,000?



SPECIAL REPORT KIDNEY DIALYSIS TREATMENT FOR VICTIMS OF THE ARMENIAN EARTHQUAKE

“RENAL DISASTER”

ices were unavailable. Within the first week after the disaster, 400 patients were treated at the Surgical Institute, and approximately 150 treatments were given



- 80% ⇒ Acute Death
- 10% ⇒ Minor injury
- 10% ⇒ Major injury



Crush Syndrome

After Acute Death due to Major Trauma
(Most common 2. cause of Death)

“RENAL DISASTER”

“RENAL DISASTER” RELIEF TASK FORCE



Kidney International, Vol. 44 (1993), pp. 479–483

Kidney Int 1993; 44: 479-83

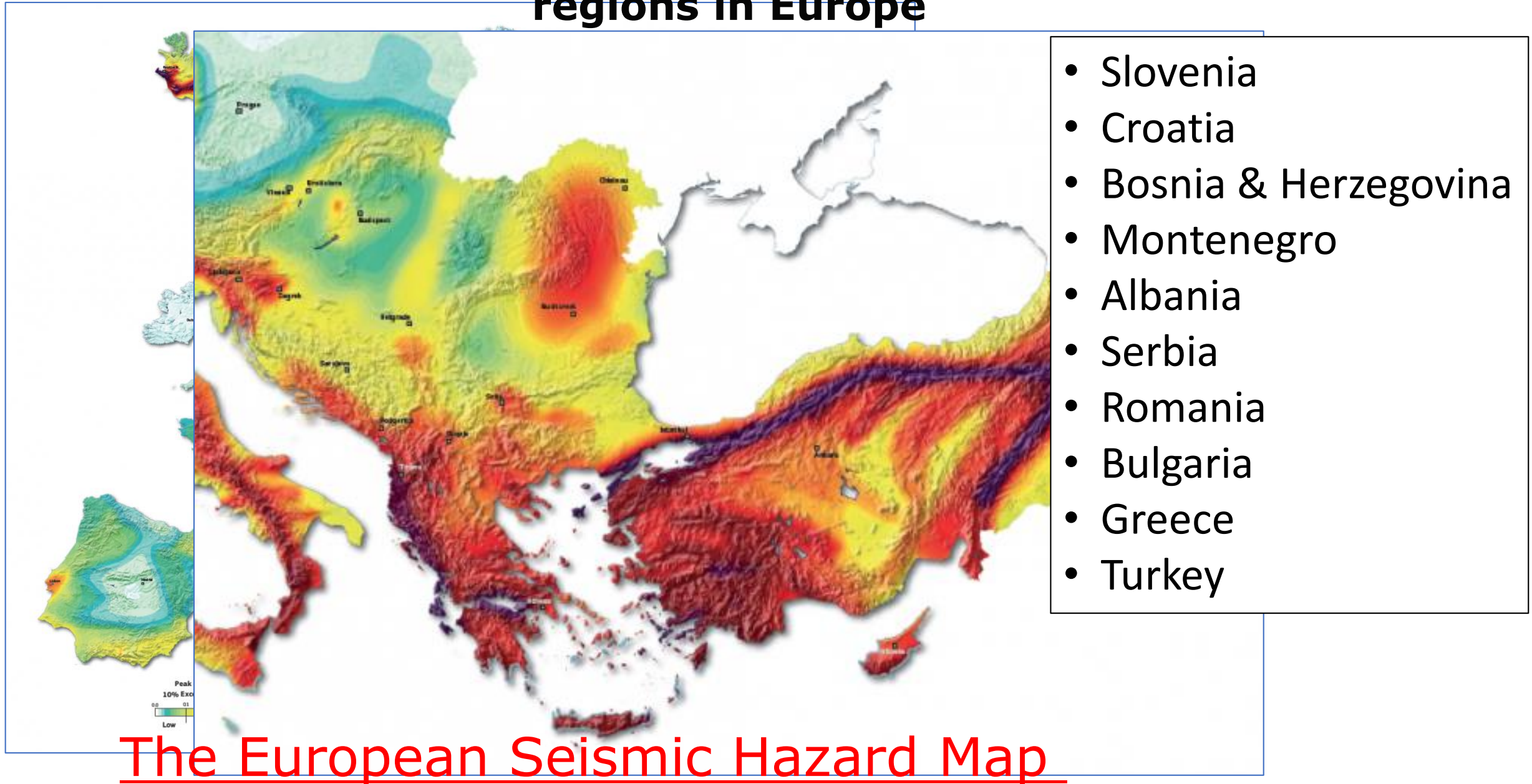
INVITED CONTRIBUTION

International dialysis aid in earthquakes and other disasters¹

**KIM SOLEZ, DAVID BIHARI, ALLAN J. COLLINS, GARABED EKNOYAN, HASKEL ELIAHOU,
V.D. FEDOROV, CARL KJELLSTRAND, NORBERT LAMEIRE, JOSEPH LETTERI,
ALLEN R. NISSENSON, ERIC K. NOJI,² J.P. WAUTERS,
and YASUHIRO YAMAMOTO**

University of Alberta Hospitals, 5B4.02 W.C. Mackenzie Health Sciences Centre, Edmonton, Alberta, Canada; Guy's Hospital, London,

The Balkan region is one of the most seismically active regions in Europe



The European Seismic Hazard Map

1999-Marmara Earthquake

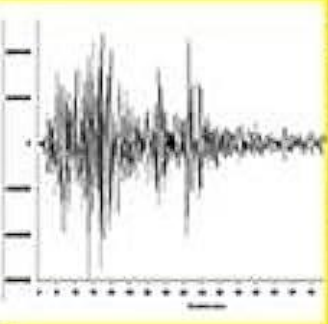


LESSONS LEARNT



THE CRUSH SYNDROME

(and Lessons Learned from the Marmara Earthquake)



Mehmet Şükrü Sever

KARGER

Lessons Learnt from the 1999 Marmara Earthquake

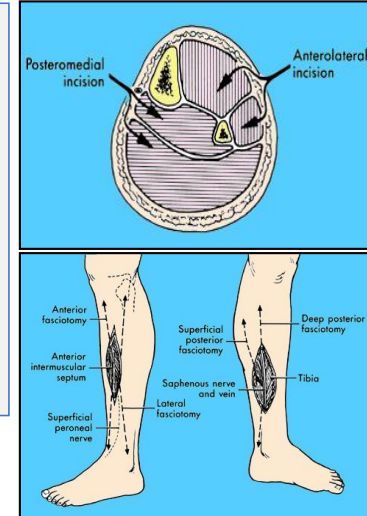
- Crush syndrome occurs in 2-5% of all victims rescued from under the rubble at times of earthquakes
- 50-75% of crush patients need RRT-Hemodialysis
- Rescue operations should continue relentlessly for at least 2 weeks
- Fasciotomies should be made with the right indications, right extent : otherwise infections and sepsis is unavoidable
- Amputation should only be made if the extremity is threatening the life
- Organization before the disaster occurs is key to mitigate the after effects



CRUSH SYNDROME



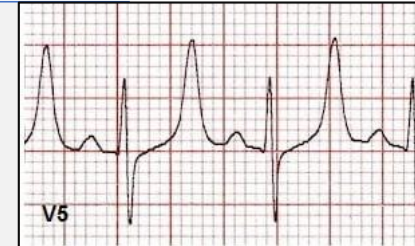
SURGICAL
Local Findings
Compartment syndrome
Other traumas
thorax, abdomen, head, spine



TRAUMATIC RHABDOMYOLYSIS

OF ALL INJURED — %2-5
OF ALL RHABDOMYOLYSIS — %30-50

Medical
Hyperkalemia
Acidosis
Hypovolemic shock
AKI
CV & Respiratory Failure
Infections



Crush Syndrome : Clinical & Laboratory Findings

Initial management



- Traumatic Crush findings
- Other trauma findings (+/-)
- Hypotension (+/-)
- Oliguria/Anuria
- Dark urine (+/-)
 - +in 50%



Hyperpotassemia

Acidosis

Hyperphosphatemia

Hypocalcemia

Creatinine kinase increase

AST increase

iv insülin /dx

Calcium

Bicarbonate

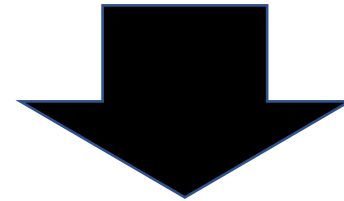
Betamimetics

HEMODIALYSIS

The victim rescued from under the rubble can rapidly deteriorate and die



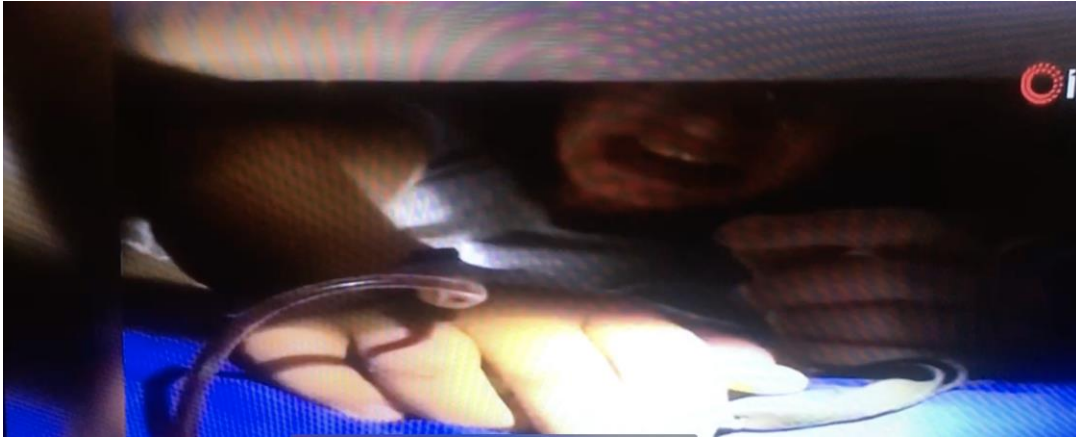
- Severe metabolic acidosis
- Hyperkalemia



**RESCUE
DEATH**

Rescue teams must have first aid instructions
Medical staff should be present in rescue teams

Is it Possible To Prevent Crush Syndrome?



✓ The best preventive measure in the disaster field is correcting the fluid deficiency

✓ Aggressive fluid resuscitation should be started during the rescue efforts

✓ Early and intense fluid treatment will prevent AKI

Early and Vigorous Fluid Resuscitation Prevents Acute Renal Failure in the Crush Victims of Catastrophic Earthquakes

ALI IHSAN GUNAL,* HUSEYIN CELIKER,* AYHAN DOGUKAN,* GOKSEL OZALP,* ERCAN KIRCIMAN,* HUSEYIN SIMSEKLI,* IZZETTIN GUNAY,* MUSTAFA DEMIRCI,* OKTAY BELHAN,[†] MUSTAFA A. YILDIRIM,[‡] and MEHMET S. SEVER*

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Abstract. This study analyzes the effects of fluid resuscitation in the crush victims of the Bingol earthquake, which occurred in May 2003 in southeastern Turkey. Questionnaires asking about demographic, clinical, laboratory, and therapeutic features of 16 crush victims were filled in retrospectively. Mean duration under the rubble was 10.5 ± 7 h, and all patients had severe rhabdomyolysis. Fourteen patients were receiving isotonic saline at admission, which was followed by mannitol-alkaline fluid resuscitation. All but two patients were polyuric. Admission serum creatinine level was lower than and higher than 1.5 mg/dl in 11 and 5 patients, respectively. Marked elevations were noted in muscle enzymes in all patients. Dur-

ing the clinical course, hypokalemia was observed in nine patients, all of whom needed energetic potassium chloride replacement. Four (25%) of 16 victims required hemodialysis. Duration between rescue and initiation of fluids was significantly longer in the dialyzed victims as compared with non-dialyzed ones (9.3 ± 1.7 versus 3.7 ± 3.3 h, $P < 0.01$). Sixteen fasciotomies were performed in 11 patients (68%), nine of which were complicated by wound infections. All patients survived and were discharged from the hospital with good renal function. Early and vigorous fluid resuscitation followed by mannitol-alkaline diuresis prevents acute renal failure in crush victims, resulting in a more favorable outcome.

After catastrophic earthquakes, many of the rescued victims later die because of preventable or treatable medical causes, most importantly due to hyperkalemia and acute renal failure (ARF) as a result of rhabdomyolysis (1). This ARF is a major component of crush syndrome, which is the second most frequent cause of mortality after the direct effect of trauma after disasters (2). Thus, calculated mortality rates of up to 40% have been reported in crush victims with ARF who require renal replacement therapy (RRT) (3,4).

The pathogenesis of myoglobinuric ARF after pressure-induced rhabdomyolysis has been extensively studied. As soon as the victim is evacuated from the rubble and perfusion of the traumatized extremity is restored, large amounts of fluid penetrate the injured muscles. The consequence of this fluid influx is hypovolemia and hemodynamic shock, which results in prerenal and later intrarenal ARF (1). In addition to hypovolemia, renal vasoconstriction and hemo-protein-induced nephrotoxicity as well as intratubular cast formation can contribute to myoglobinuric ARF (1,5). Because hypovolemia is the key component of this syndrome, early and generous

fluid replacement has been suggested as the most effective method for preventing ARF related to crush syndrome. However, if this treatment is inadequate or delayed for more than 6 h, ARF is almost inevitable (1).

The city of Bingol, Turkey, located in the southeastern part of the country, was hit by a catastrophic earthquake on May 1, 2003, at 03:27 a.m. local time. The disaster registered 6.4 on the Richter scale and lasted for 17 s. According to the official statistics, 177 people died and 519 were injured, many of whom were students sleeping in the dormitory of their school (6). Seventeen victims had extensive muscle injury and were candidates for a diagnosis of crush syndrome. Twelve of these 17 victims were the above-mentioned students, 11 of whom were treated in our facility; 5 of the 17 victims were adults trapped in their homes. Of these patients, one was treated in Diyarbakir Dicle University Hospital. The remaining 16 were treated in Hazir at First University Hospital. This study documents the epidemiologic, clinical, and laboratory features and therapeutic interventions applied to 16 crush victims who were treated in the latter facility.

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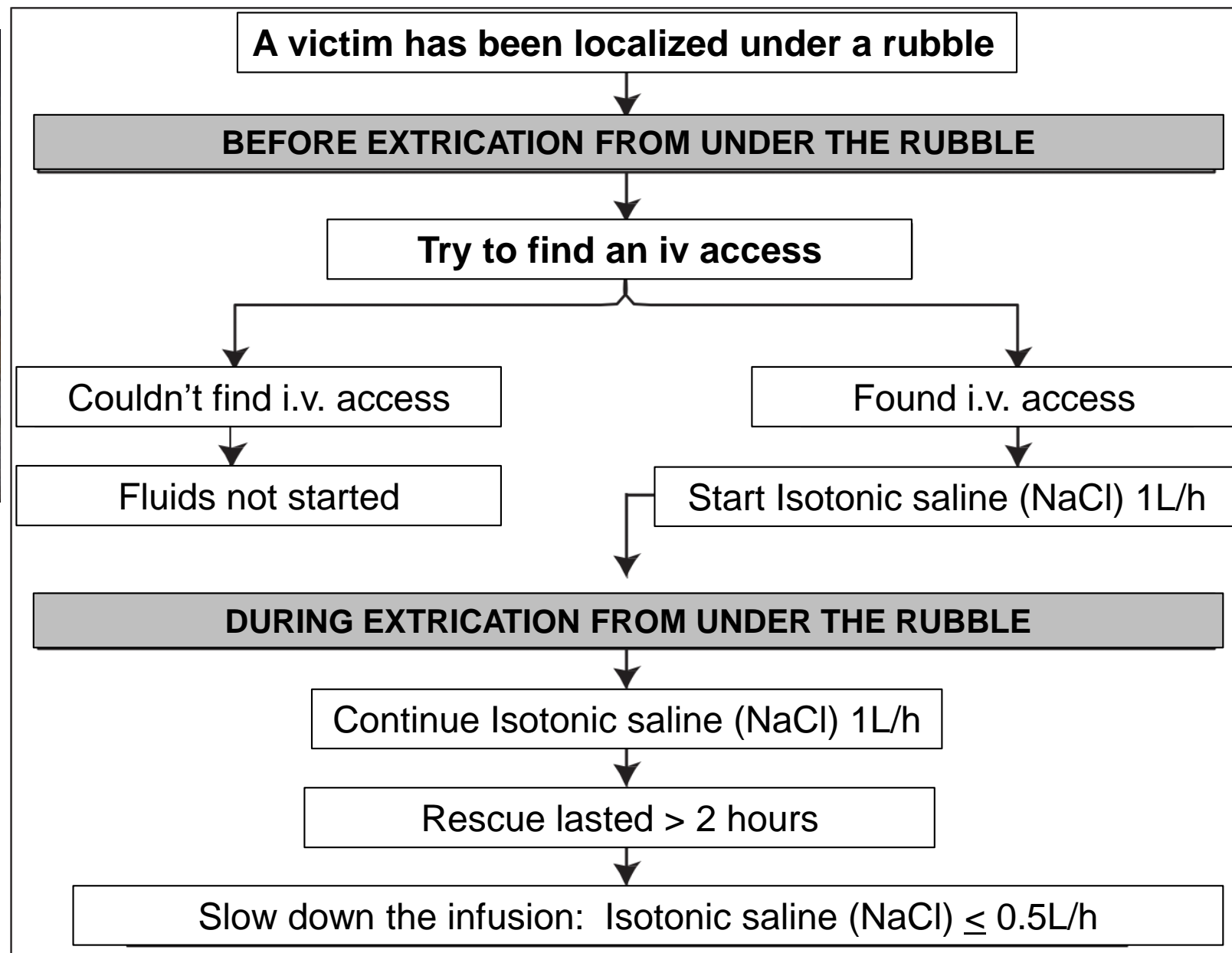
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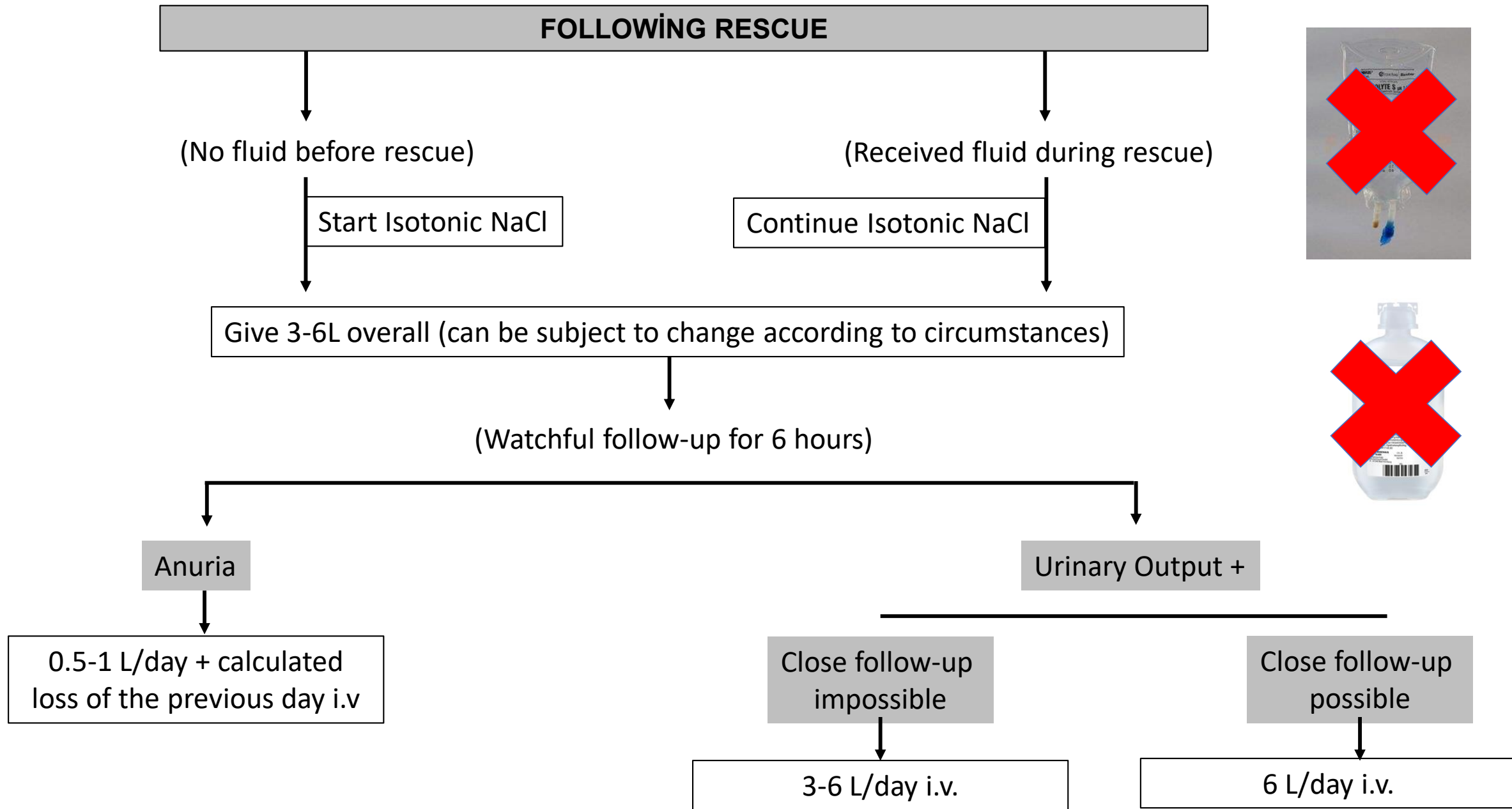
DOI: 10.1093/ajkn/kn0012006.0076.3i

Patients and Methods

The Disaster

The city of Bingol, the epicenter of the disaster, with a population of 70,000 people, is close to the East Anatolian Fault Zone, which has historically been the location of many catastrophic earthquakes (7). Overall, this region is a sparsely populated, rural area that includes some of the other major cities of the country, such as Elazığ, Diyarba-





Following Mass Disasters...

- Authorities concentrate on the most urgent needs
 - Housing/Shelter
 - Food
 - Sanitation- prevention of epidemia
 - Rescue operations
 - Transportation
 - Safety issues
- What about patients with chronic diseases and with special needs
 - Diabetes, Oncology, Chronic Kidney Disease, CVD, HT
 - Patients on dialysis, elderly, disabled



General
Population

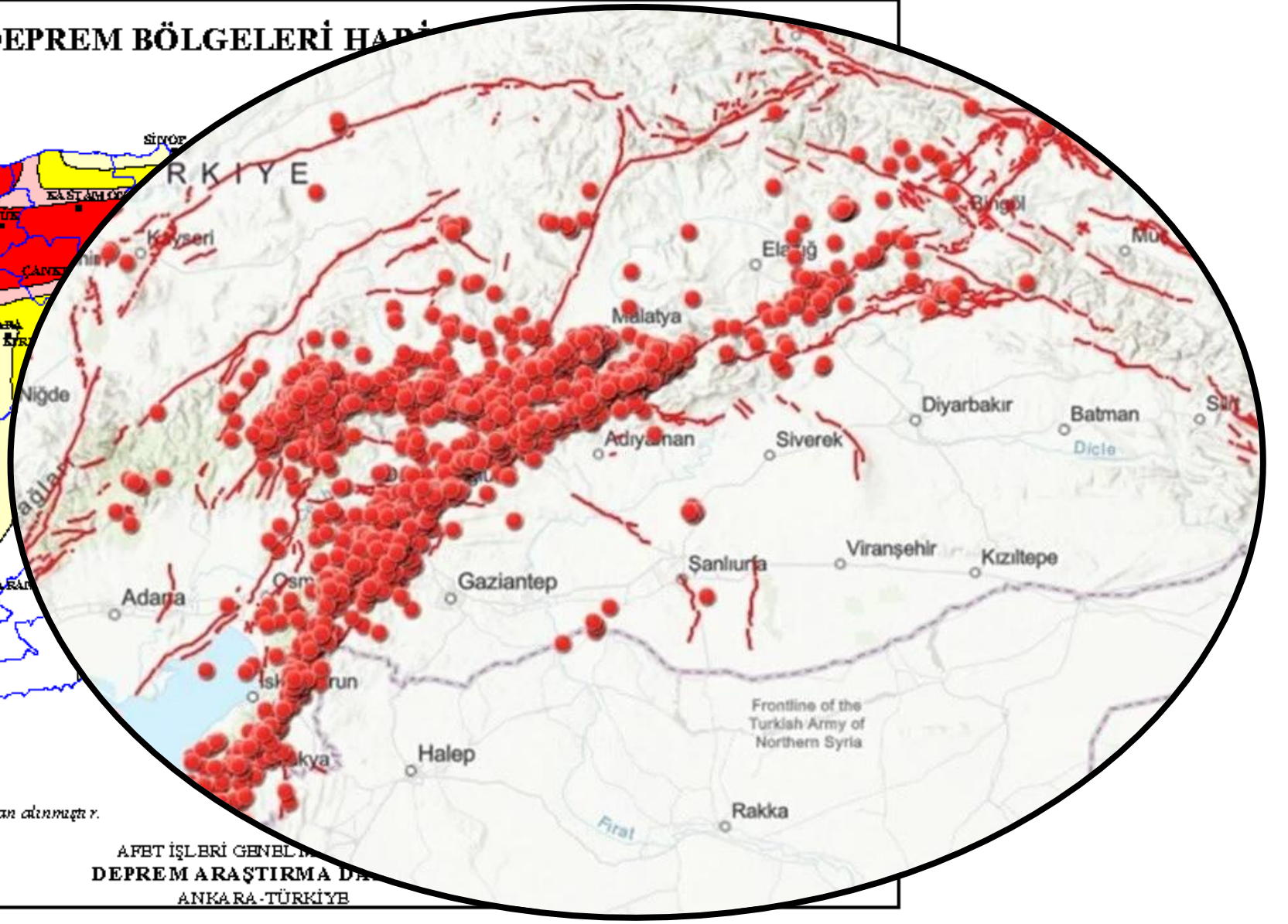
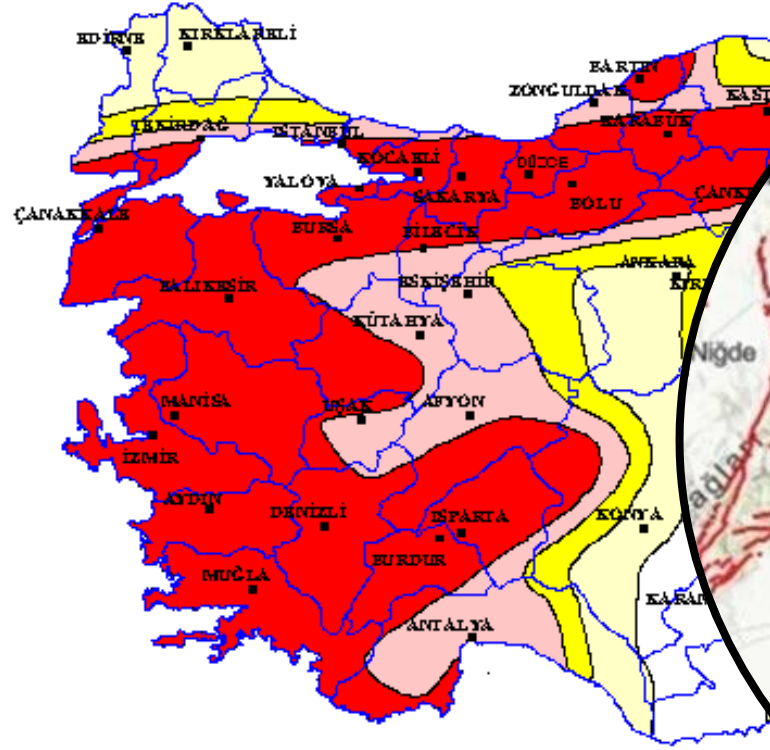


Patients with
Special needs

Patients on RRT at times of Disasters: Challenges

- For patients on HD
 - Access to dialysis centers may not be possible
 - Dialysis staff may themselves be unable to reach to the center and/or may not be able to work
 - Access to medications may be impaired
 - Dialysis centers may be unable to operate
 - Patients may be on dialysis during the disaster
- For patients on PD
 - Access to solutions may not be possible
 - APD may not be used due to power cut-offs
 - Hygienic environment may not be available
- For patients with kidney transplant
 - Access and availability of immunosuppressive medications may be a problem

DEPREM BÖLGELERİ HARİTASI



• T.C. Bayındırlık ve İskan Bakanlığı, 1996

B.Özmen, M.Nurkılıç ve H.Güler'in 1997 yılında hazırladıkları,

"Coğrafi Bilgi Sistemi ile Deprem Bölgelerinin İncelenmesi" kitabından alınmıştır.

AFET İŞLERİ GENEL MÜDÜRLÜĞÜ
DEPREM ARAŞTIRMA DAİRESİ BAŞKANLIĞI
ANKARA-TÜRKİYE





Renal Disaster Task Force of TSN and Distribution of Regions

2021

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Dr. R. Kazancıoğlu
Dr. S. Öztürk
Dr. Mahmut Gök

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Dr. M. Sipahioğlu
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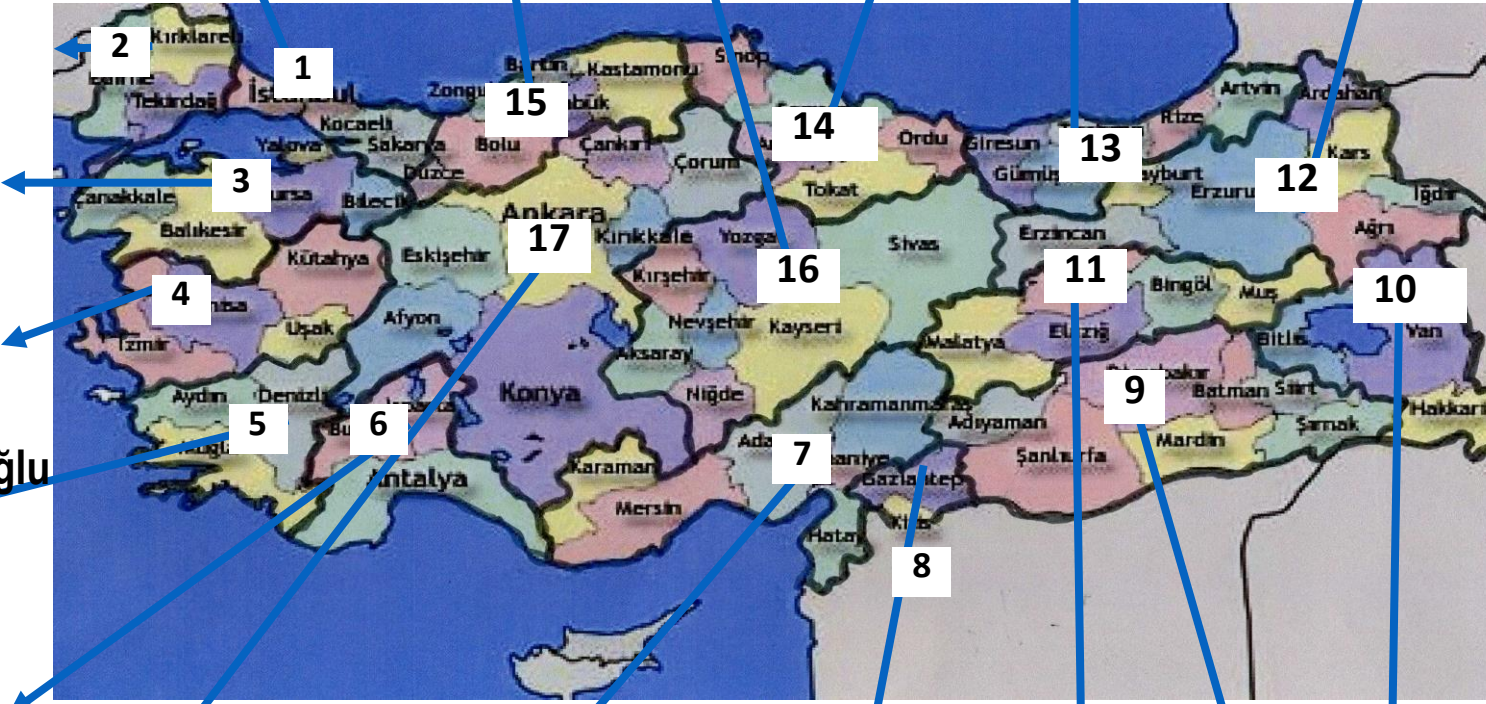
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Dr Mehmet Tuncay-Gantep
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Dr Ayşe J.G Keskin-Mersin
Dr Serhan Pişkinpaşa-İskenderun
Dr Ramazan Daniş-Diyarbakır
Dr Dilek Torun-Adana
Dr. Berfu Korucu-Osmaniye

What does the local RDTF do?

Disaster free period

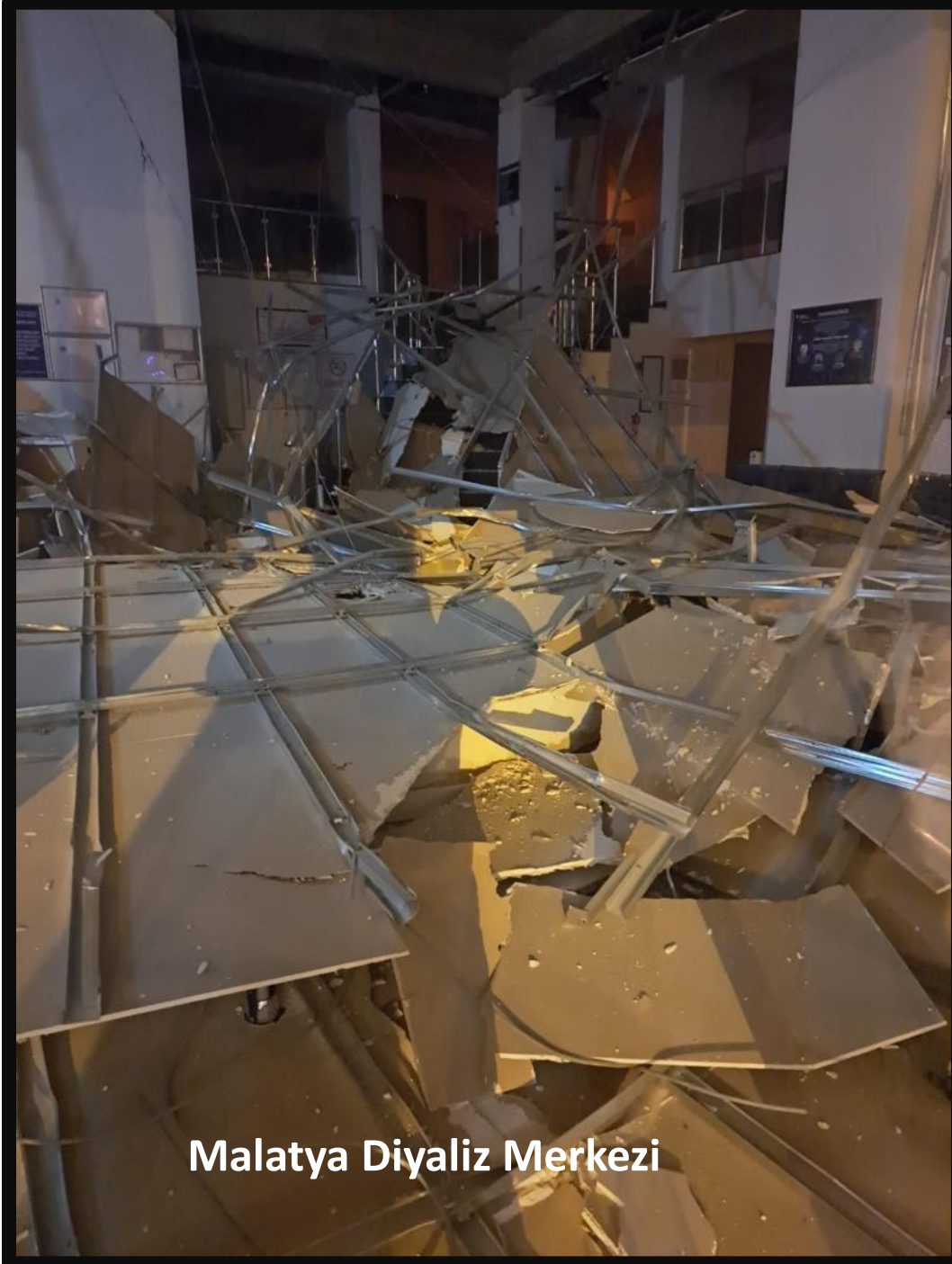
- Educational activities
 - Health staff/rescue teams
 - Prevention and treatment of Crush Syndrome
 - Organization of dialysis
 - Patients
 - How to survive when dialysis not available
 - Drink less, avoid K containing food ect.
 - Medications should be within easy reach, ready to grab- a month's supply
 - How to detach from dialysis
- Planning of services

Immediate disaster period

- Rapid communication within the TF
- Information about the extent of damage- regular updates through local coordinators
- Defining the needs: supplies, medication, health staff: dialysis nurses support
- Re-organize patient distribution
- Avoid burn out, support through volunteers

Recovery Phase

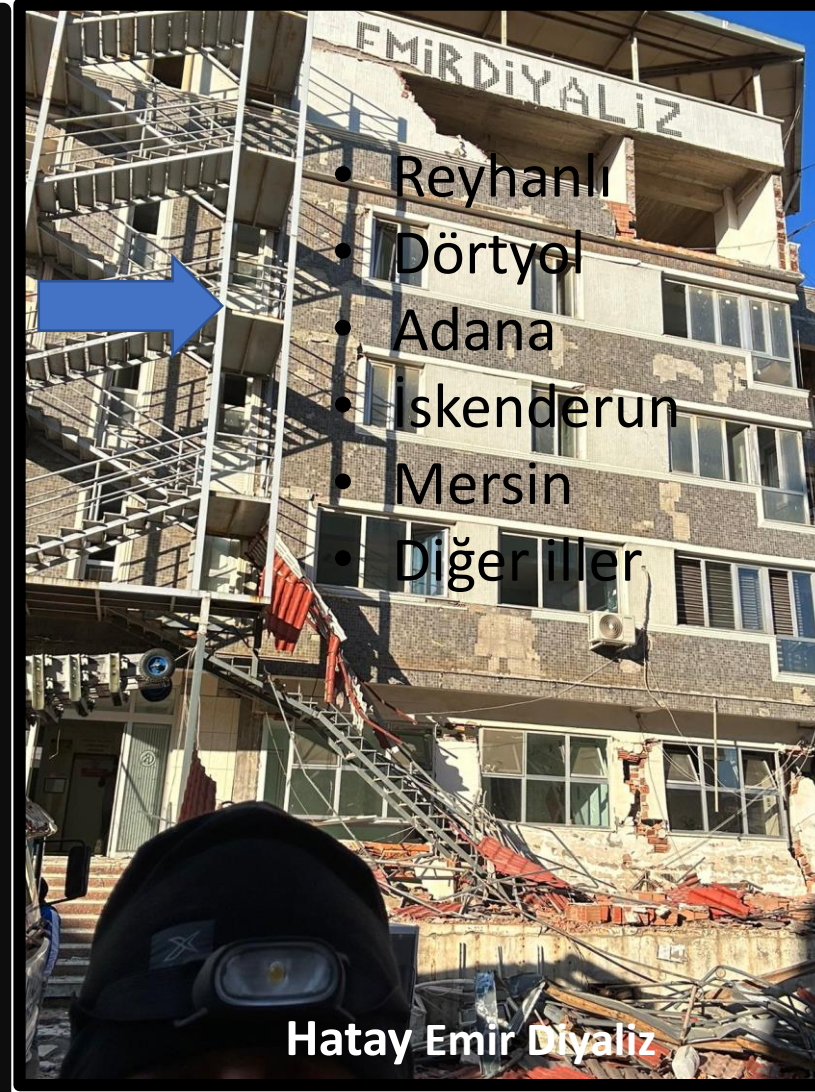
- Re-assess the needs
- Define pitfalls
- Assess the damage, losses
- Analyze data



Malatya Diyaliz Merkezi



Adiyaman Diyaliz Merkezi



- Reyhanlı
- Dörtyol
- Adana
- İskenderun
- Mersin
- Diğer iller

Hatay Emir Diyaliz

Major points of planning

- Estimated number of crush injuries- 1500
- Transfer of patients on chronic dialysis to private/state satellite units
- Preparing the hospitals to receive crush injuries
- Organizing the shifts for nurses and doctors
- Numbers of patients with Crush injuries reaching the hospitals

Sudan

Man –Made Disasters: Armed conflicts

Ukraine



How is an International RDRTF helpful

- Supporting for supplies: dialysis, catheters, medications, health staff: dialysis nurses, technicians, doctors.
- Catalyzing communication between NGOs, procurers

**Marmara Earthquake
1999**

>600 Crush cases



**ISN-RDRTF
MSF**

**Ukraine Crisis/2022
Armed conflict**

**10000 Dialysis pts/ 700 displaced
1500 tx pts-**



**ERA-RDRTF
MSF/WHO/Direct Relief
FMC/Bbraun
Chiesi/Vifor**

**Sudan Crisis
Civil War
2022**

**8000 Dialysis Pts
4000 Tx Pts**



**ISN-ERA-ASN
AFRAN**

To conclude...

- No where in the World is free from disasters
- Patients with kidney diseases are among the most vulnerable
- Preparedness is the key to mitigate the effects of disasters
- Renal Disaster Task Forces may have an important role in preparedness for disasters

