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The Syrian conflict: assessment of the ESRD system and response to hemodialysis needs during a humanitarian and medical crisis

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Introduction

The provision of in-center hemodialysis, the most common treatment modality for end-stage renal disease (ESRD), is rather complex and requires the presence of sophisticated infrastructure along with the expertise of technical, nursing, and medical staff. Patient-related outcomes due to the interruption of this infrastructure by natural disasters have been described in many instances,[1–3] but less is known on how ESRD patients are harmed by war zones.[4–6]

The current Syrian conflict, which began in 2011, has led to what is described as the greatest humanitarian disaster of the past two decades. The number of refugees at the end of 2013 was estimated to be close to 2.5 million, and the number of internally displaced people was more than 6.5 million.[7] Humanitarian and medical aid to Syrians varies widely according to location, and it is worse in opposition-controlled compared with government-controlled regions.[8,9]

The epidemiology of ESRD in Syria prior to the conflict is not well described. A 2006 peer-reviewed publication from the city of Aleppo estimated the prevalence of hemodialysis-treated ESRD to be about 226 patients per million inhabitants.[10] Peritoneal dialysis had a very low penetration. Under the original system, patients received dialysis in government-owned hospital-based facilities for free or at discounted rates, or at private clinics for a fee. Most patients dialyzed twice a week. The website of the Syrian Society of Nephrology, which at the time of our retrieval had not been updated since 2010, listed more than 100 dialysis centers with close to 500 machines in the country.[11]

A 2005 publication from the Syrian Ministry of Health supported by the European Union Health Sector Modernisation Programme estimated that Syria had about 10,000 ESRD patients who required renal replacement therapy. The publication reported that the existing units performed 150,000 dialysis sessions per year. At a frequency of two sessions per patient per week, which is the average in Syria, we calculate that the number of ESRD patients receiving hemodialysis at government facilities was less than 1500. The authors commented that they had no data on dialysis in the private sector, but noted that the yearly cost of 500,000 Syrian pounds (US$10,000 in 2005) was beyond the ability of most Syrians.[12]

The Syrian National Kidney Foundation is a group of renal providers residing both inside and outside Syria that was formed in 2013 for the purpose of improving outcomes of Syrian nephrology patients affected by the conflict.[13] In this publication we shed some light on what has happened to the hemodialysis ESRD system and patients in Syria as a result of this conflict. We primarily focus on the provinces of Aleppo, Idlib, and Homs because of the dire situation that resulted from the collapse of the preexisting health-care system as a result of the conflict. In government-controlled areas no statistics are available to the authors, although there have been reports of supply shortages and machine breakdowns in some facilities. The situation in opposition-held areas is more dire, with most health-care facilities damaged or destroyed and more than 70% of health professionals having fled.[9]

Results

Dialysis facilities and funding sources. Before the conflict began in 2010 there were 44 dialysis facilities with a range of 2 to 24 machines in the Aleppo, Idlib, and Homs provinces. During the conflict there were attempts to establish 14 new facilities. The status of all these 58 facilities is summarized in Table 1.

Centers operating in besieged areas of Homs province and under opposition control in Aleppo province lost government support and had significant financial difficulties. In opposition-controlled areas with feasible cross-border transit of aid, mainly through Turkey, funding and supplies were more easily available. While Syrian govern-

Table 1 | The status of dialysis centers in the Syrian provinces of Aleppo, Homs, and Idlib in 2013

	Preexisting (44)	New (14)
Confirmed operational	20	10
Closed due to destruction, theft, or occupation by armed forces	7	0
Closed due to lack of funding	6	0
Never operated due to lack of resources	0	4
Status unknown	11	0

ment support was lost in opposition-controlled areas, funding from nongovernmental organizations (NGOs), including some affiliated with the dialysis industry, and private donors compensated for this loss. Most of the funding sources lacked basic knowledge about dialysis facility operation, which led to a situation in which there is a relative abundance of dialysis machines and lack of other components such as adequate water treatment systems and disposables.

Idlib province, which borders Turkey, is a good example of this phenomenon. In 2010 prior to the conflict the province was reported to have had three government-run dialysis facilities serving about 350 ESRD patients and no nongovernment facilities. At the time of our survey, one of these centers had already closed, and the other two were still run by the Ministry of Health, dialyzing close to 200 patients. In the opposition-controlled northern part of the province there were projects to establish nine new centers. At the time of our survey, five were operational and four were non-operational with machines on site but no monetary funding for running cost and no water treatment systems. One of these non-operating centers had four new state-of-the-art machines donated by a charity but lacked funding for all other components of the dialysis operation. We estimated that the newly established centers in Idlib province dialyzed about 100 ESRD patients regularly.

All new centers were charitable; small (one to five machines); and more likely to be located in rural areas. The machines were often used or refurbished and tended to break down owing to lack of availability of supplies and technical support. Most water treatment systems were inadequate with irregular maintenance and absence of any water-quality analysis.

Human resources. None of the 13 facilities operating in the opposition-controlled areas had an on-site nephrologist. One facility had an internist who dedicated most of his practice to dialysis patients' care, and the rest were only staffed by patient care technicians with either a nursing degree or on-the-job training, with some availability of physicians who usually lacked basic dialysis knowledge. These technicians were often in charge of machine and water system maintenance as well as providing medical care. Nephrology coverage was available to at least five centers via telemedicine provided by expatriated specialists. In relatively safe areas in the north, many centers were visited periodically by these expatriate specialists to provide staff education, direct patient care, and aid with machine maintenance. In one instance, inservice on dialysis machines donated by a US dialysis corporation was provided via Skype by a volunteer US nurse. Surgical specialists who could provide vascular access care were generally available. Local nephrologists were more available in non-contested government-controlled areas, but many were reported to have left the country.

Patient-related outcomes in opposition areas. For most patients, blood transfusion was the only method for anemia management. Phosphorus and parathyroid hormone measurements were not available, and most patients received a fixed dose of calcium carbonate and active vitamin D if available. Hepatitis testing was not routinely available. Accurate survival data on the dialysis population were not available.

Death due to lack of dialysis was common. The medical director of a dialysis facility in Homs province reported the death of about half of its 35 patients in 2011 from lack of dialysis after the occupation and closure of the hospital that housed the dialysis facility by armed forces.

In one dialysis center, all 18 patients reported that they went for at least one week without dialysis because of inability to get to a dialysis clinic as a result of transportation difficulties or temporary or permanent closure of the facility. It was common for the same patient to receive dialysis at more than one center according to safety concerns and functionality of the center. There was evidence of collaboration between dialysis facilities as they were open to accepting transient patients, and exchanging supplies,