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Health providers' professional accounts of violations of the right to health in Syria – a right denied.

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Abstract

Objectives: To explore the impact of the conflict in Syria on health care through the experiences of health care providers using a public health and human rights lens.

Design: A qualitative study using semistructured interviews using a thematic analysis approach.

Setting : Interviews were conducted at a medical relief organization in Gaziantep, Turkey

Participants: We examined data from 29 semi-structured in-depth interviews with qualified health professionals with current or recent work-related experience in opposition-controlled areas of Syria.

Results: Findings highlight the health worker experience of attacks on health infrastructure and services in Syria and consequences in terms of access and scarcity in availability of essential medicines and equipment. Quality of services is explored through physicians' accounts of the knock on effect of shortages of equipment, supplies, and personnel on the right to health and its ethical implications. Health workers themselves were found to be operating under extreme conditions, in particular responding to the most recent chemical attacks that occurred in 2017, with implications for their own health and mental wellbeing.

Conclusions: The study provides unique insight into the impact war has had on Syrian's right to health through the accounts of Syrian health professionals, with continuing relevance to the current conflict and professional issues facing health workers in conflict settings.

Strengths and Limitations of the Study

- This study uniquely explores the experiences of health care providers providing health care during the current conflict in Syria.
- The study revealed the ways in which the conflict has impacted health providers abilty to provide health care in accordance with patients right health.
- The findings have implications for capacity building to counter the challenges faced by Syria's health professionals.

- Interviews were limited to the experiences of a small sample of health workers working in conflict affected regions of Syria.

1. Background

The ongoing civil war in Syria has created the direst humanitarian crisis of our time. Syria's health care system has been decimated and the healthcare community targeted as part of an ongoing military strategy by the Syrian government, now supported by Russian air power.[1] Although initiatives exist to assist health providers operate in insecure environments,[2,3] little research has unpacked the operational, professional, and personal challenges health providers face when operating in such a violent setting.

Human rights organisations and UN agencies have placed a spotlight on the Syrian Government's assault on health care.[4] Physicians for Human Rights documented 478 attacks on medical facilities and the killing of 830 medical personnel since the start of the conflict in 2011, the vast majority by the Assad regime. [4] At the commencement of this research in 2014, nearly 75% of hospitals and one third of primary care facilities were either not functioning or were significantly restricted in their ability to provide services.[5] The World Health Organization has reported severe shortages of medical supplies, spotty vaccination coverage, lack of capacity to address severe health needs and a critical shortage of health providers.[5] In addition, medical providers have had to respond to the unprecedented use of toxic chemical agents used against civilians since the commencement of the war in December 2012, most recently a sarin gas attack in April 2017 in Syria's northern Idlib province. [6-8]

In Syria the health care context is currently made up of three separate health "systems": the first is run by the Syrian government and is restricted to areas it controls; a second system is comprised of an ad hoc collection of local and international non-governmental organisations (NGOs), local committees, and relief agencies operating primarily within opposition-controlled areas; and a third system is maintained by the Islamic State (ISIS) in areas it controls.[9]

Health care workers operating within opposition-controlled areas have struggled to provide services in the midst of a multi-dimensional crisis.[10] A protracted war on the public health infrastructure has led to inadequate access to basic necessities and a unprecedented humanitarian crisis.[11-15] It is in this setting that health providers must make daily decisions at the

micro, meso, and macro-level of healthcare provision (e.g., who receives care, which hospital to repair, where to target supplies).

Obligations under international humanitarian law include requirements not to attack or interfere with health care services.[16] Obligations under the human right to health include ensuring the availability, accessibility, acceptability, and quality of health facilities, goods and services.[17]Drawing on the right to health as a key conceptual framework, this study explores the complex challenges health workers face in providing care when health care services and personnel are themselves subjected to violence and forced to operate in the midst of ongoing human rights violations and war crimes.

2. Methods

Qualitative research was conducted in October 2014 and July-August 2017 with health care providers working in northwest Syria. The study sought to: 1) describe attacks and interferences with healthcare occurring in opposition-controlled areas of Syria; and 2) explore the challenges health workers face and the consequences for civilian's right to health.

2.1. Setting

Qualitative fieldwork was collected in Gaziantep, Turkey, a city 97 kilometers north of Aleppo, Syria, as well as by secure video link with health workers inside Syria. Gaziantep is host to Syrian and international NGOs, and is a humanitarian hub for cross-border support. Among the Syrian NGOs operating out of Gaziantep is the Syrian American Medical Society (SAMS), who partnered with the Johns Hopkins Bloomberg School of Public Health (JHSPH) on this project.

2.2. Study Population

Health professionals working in Syria in 2014 and 2017 were interviewed, either in person while in Gaziantep to attend a SAMS medical training workshop (2014), or from within Syria (2017) using Wire, an application that allows for secure/encrypted communication. All participants were identified through purposive sampling methods, taking account of key informants' specialized knowledge and unique perspectives. Eligibility criteria required participants to be aged 18 years or older and a qualified health professional with current or recent

work-related experience in opposition-controlled areas of Syria. Participants were told the purpose of the study and how the information provided would be used and that participation was voluntary. Permission was sought and in all but one case granted for audio recording; no names or other identifiers were collected. With the exception of respondents who were fluent in English, interviews were conducted in Arabic either through an Arabic translator or Arabic-speaking interviewer. The 2014 interviewer (LR) concluded with a final sample of 27 when no new themes emerged. Three of the interviews conducted were excluded from this analysis due to poor audio quality, incomplete interview, or declining audio recording. An additional five interviews were conducted in 2017 by an Arabic speaking interviewer (DR). Audio-recordings were transcribed verbatim and triangulated with additional notes.

2.3. Measurement and Analysis

Interviews followed a semi-structured interview guide that was developed in accordance with the aims of this study. This analysis reviews the challenges health care providers face and the constraints on patient care when approached through a right to health lens of accessibility, availability, and quality of care.

Two independent reviewers (EC, KF) conducted the coding and analysis using an inductive and deductive approach to coding that relied on a priori topics, while still allowing for the emergence of new themes through a process of thematic analysis.[18] First, researchers read through the transcripts to familiarize themselves with the data, three transcripts were then open-coded to delineate established and emergent categories. Coding categories were based on a priori topics around the right to health, and new concepts that emerged from the data. The researchers compared coded transcripts to identify discrepancies and further define the coding scheme. The codes were reviewed by KF, EC, and LR. Clean transcripts were imported into Hyperesearch 3.7.2 and coded using the final scheme developed by the analysts.

2.4. Ethical Approval

The JHSPH Institutional Review Board and a local review board approved research protocols for the 2014 and 2017 interviews. Study participants provided informed consent to be interviewed. All participants in accordance with IRB procedures were explained the purpose of the research, were free to decline to participate, and told of their liberty to withhold information they were

uncomfortable to give. Finally, we assured and accorded them privacy, anonymity, and confidentiality.

3. Results

3.1. Sample characteristics

Of the 29 participants in this sample, all but two were Syrian male health professionals. The non-Syrian health professionals were female Americans who had recently worked in Syria, and were interviewed in 2014. The respondents had varied experience levels and medical professional backgrounds and had experience working in occupation-controlled areas of northwest Syria. (Table 1) Below we present key findings emerging from our analysis of accounts of medical professionals providing healthcare in Syria.

Table 1 – Participant Demographics

Total Participants	29
Gender	
Male	27
Female	2
Nationality	
Syrian	27
American	2
Profession	
Surgeon	13
Cardiologist	1
Anesthesiologist	2
Pediatrician	1
Nurse	4
Dentist	2
Technician	4
Health Co-ordinators	2
Governate	
Idlib	13
Aleppo	7
Latakia	3
Hama	4
Rif Dimashq	2

3.2. Availability

The targeting of hospitals and ambulances in opposition-controlled and besieged areas has dramatically decreased availablity of health care. Participant descriptions capture both indiscriminate and targeted attacks, including the use of mortar shells, TNT barrel bombs and nerve agents, often with multiple attacks on the same facility. A physician described constant bombardment of a hospital in Latakia:

"Interviewer: How many times has the hospital been hit in three months?
Respondent: Almost 90 times. It's on a daily basis…. The furthest time was 100 meters. Sometimes it's 10 meters, 15 meters away from the hospital." (Interview 8, 2014)

Health care workers have responded to the constant attacks and attempts to obliterate healthcare availability by developing methods to protect themselves, their patients, and their equipment. In response, nearly all participants described a common strategy of placing hospitals underground. However, doctors explained that even fortified hospitals underground or in a cave are vulnerable, in particular if exposed to a chemical attack, especially to heavy sarin gas:

"We operate in a fortified hospitals underground, but with chemical attacks all hospital are susceptible to the chemical attacks and getting destroyed." (Interview 1, 2017)

The ongoing conflict has restricted movement and limited the availability of health supplies. Medicines and equipment for trauma cases and the management of chronic diseases, and treatable childhood diseases were highlighted as being in short supply:

"Because there are no vaccinations we now see polio and measles. All these diseases are different, some diseases need specific medication, and we haven't any." (Interview 12, 2014)

In particular participants describing the medical response to the 2017 chemical attacks, highlighted that hospitals lacked sufficient supplies of appropriate antidotes to treat the nerve agents civilians were exposed to:

"Our hospital wasn't equipped to treat chemical attacks, since we thought that chemical weapons were eradicated since 2013. Back then we brought big amount of Atropine to treat chemical attack victims but the medication expired and we never used it." (Interview 1, 2017)

The provision of medical supplies and medications, including protective equipment for chemical attacks, improved by 2017 through the work of humanitarian organisations, but all participants described the continued scarcity of life-saving, protective equipment and inadequate availability

of specialist care. Given the high volume of serious traumatic injuries, availability of essential equipment and qualified physicians is essential to protect the right to health of those injured by conflict. However, in the absence of resources and training, physician accounts highlighted altered standards of care implemented in order to preserve life:

"Lack of surgeons caused many cases to either be amputated after treatment, result in death or face complications. A lack of instruments for orthopedic and neurosurgery have also caused many complications. Despite this difficult reality, we are still doing 4,500 surgeries each month." (Interview 2, 2014)

With respect to the chemical attacks, healthcare workers were also placed at increased risk of harm due to the lack of availaibility of appropriate safety equipment when treating patients exposed to chemical agents:

"Honestly, we still haven't received fully protective equipment. When the medical staff got affected (and after we saw how people are getting affected even when they thought they were protected) …, this is when we started using masks but even masks weren't good enough,.."(Interview2, 2017)

3.3. Accessibility

Attacks on hospitals during the 2017 sarin attacks limited patient access to hospitals at precisely the moment that it was most critical:

"We witnessed the aircraft striking the city 6 times, firing exactly 11 missiles. Once the aircraft was gone, we went to the hospital and we saw that the air strikes were targeting the hospital where the chemical attack victims were transferred to get treatment. By the time we got to the hospital, we found that the whole staff was gone from fear and a big part of the hospital was destroyed. One patient was undergoing a surgery, his blood was still on the operating table." (Inteview 3, 2017)

Even where hospitals are not completely destroyed, the impact of bombardments on health care access is profound, with many participants describing regular interruptions and closures. Fear of attacks on hospitals has an indirect but major impact on patient access to health services. As a general practitioner explained:

"Lots of people don't dare to go to the hospital, because they know that the hospital has been targeted by the bombardment – five, six times. It's only those who are in grave need who will go to the hospital." (Interview 11, 2014)

For civilians who have been injured in attacks or who are unable to travel to a hospital for other reasons, medical care access is dependent on first responders or civilian transportation. However,

ambulances are in short supply, in part due attacks on them, and the risk to first responders is great, as they are easy targets for aerial attacks:

"There were many cases when ambulance drivers have been attacked, especially at night in the dark. The aircraft see the lights of the ambulance and attack it." (Interview 2, 2014)

At times of acute crisis, such as the recent chemical attacks, lack of prompt access to facilities owing to long transport times and restricted capacity, has meant many additional civilian fatalities:

"There is no clear strategy for the health system tactically or operationally to deal with the number of injuries, and nerve injuries are a new topic for us. If there had been a medical point nearby, maybe one or two kilometers away from our hospital, we would have saved a lot of people." (Interview 5, 2017)

Finally, the difficulties and dangers of transporting supplies and equipment into besieged areas was highlighted as another access issue that poses severe risks for health workers. One participant reported that 28 staff from their hospital had been arrested while attempting to carry medicines and supplies to their hospital:

"Taking medicine into [town name], is a crime that is punished…they go to prison and nobody knows after that, of course it's torture." (Interview 7, 2014)

3. 4. Quality

Make-shift hospitals (known as field hospitals) emerged in opposition-controlled areas as a result of the assault on medical care in rebel held areas of Syria, replacing hospitals and clinics formerly serving Syria's population. These field hospitals are located in former factories, farms, and schools. Although Syrian health workers and their supporters provide supplies and equipment to these field hospitals, in many of them it is extremely difficult to maintain standards of care, especially at times of mass casualties from attacks, as evidenced in health care workers' descriptions:

"Everything is allowed in a field hospital. You can put the intravenous line in with alcohol - we do it all the time. You can do operations without sterilized matters, without anesthesia machines." (Interview 15, 2014)

During the 2017 chemical attacks, some hospitals that had been closed down for safety reasons were reopened to deal with the overwhelming number of casualties:

Most of the hospital was destroyed [by an attack on April 2nd 2017] *and it was out of service, but the fact that the other hospital wasn't capable of dealing with the big number of patients, they*

had to re-activate the emergency department even though it was very risky, so they can receive some patients. (Interview 3, 2017)

Participants also reported that because of the high number of trauma cases, patients with other medical conditions were often left untreated. During the chemical attacks triage decisions led to a lack of attention to the the most vulnerable, including large numbers of affected children. Participants' accounts highlight that medical personnel such as dentists and anesthesiology technicians are acquiring new skills to meet the chronic shortage of surgeons and anesthesiologists, because so many health workers have fled Syria. Here a dentist describes how he undertook maxillofacial surgeries:

[Interviewer: Part of your dental training was in that kind of surgery?] "No, it was just a minimal part of it, I was given just an overview of these types of surgeries, but out of necessity I've had to do these surgeries." (Interview 1, 2014)

Participants involved in treating patients in the most recent chemical attacks were frank in describing how ill prepared the medical sector were, with training and equipment inadequate to meet the demands of the overwhelming crisis. This resulted in a highly variable quality of care at medical facilities:

I think that medical providers barely saved 1-2% of the chemical attack victims, because the situation is totally different, we have no prior training, medical staff or equipment to deal with it. I believe what we were able to provide was too little. (Interview 1, 2017)

The continued outward migration of healthcare providers from Syria, and resulting shortage in quality clinical care has also been exacerbated by the relentless targeting of healthcare services and recent chemical attacks:

"Some of healthcare providers decided to stay in Turkey and not to go back to Syria until things are clearer, others said that the use of chemical weapons is something that will never stop. We won't be able to provide much and we might turn into patients ourselves with no treatment, so medical staff were evaluating how beneficial they can be over there" (Interview 3, 2017)

3.5. Health Worker Demoralization

The constant attacks to health infrastructure and the barriers to health care access, availability, and quality that result, impact not only civilians who seek treatment but also the health workers who provide care. Interviews highlighted a complex constellation of factors that impact health workers' day to day working conditions. As this participant described:

"You are working with bad health supplies and instruments, and short of financial support. We have also a great danger of being killed because of bombing all the time. All those factors make a great pressure on doctors... Especially the doctors that work for health organisations and in the opposition, they are under focus from the regime." (Interview 2, 2014)

Conditions remain violent, with participants interviewed following the 2017 chemical attacks drawing attention to the rising death toll among doctors and enduring sense of fatalism among those who remain:

The past year Dr. [name omitted] *passed away in April* [exposed to chemical agents while treating a patient] *and another anesthesiologist passed away. There have been about 5-6 deaths from our medical staff within the organization. The truth is that work in the northern countryside is considered suicide. (Interview 5, 2017)*

The stress of providing care during war is made worse because of the scarcity of health workers. Many participants reported that they work 24-hour days because there are no other staff to relieve them of their duties. Additionally participants described often feeling useless because of the number of people they could not assist. A participant explained health worker's relentless workload, coupled with the extreme trauma related injuries they respond to:

"Sometimes it takes them from 8:00 in the morning till 12:00 in the evening doing operations only. And because of the lack of the staff they are obliged to stay in the hospital, and moving from one operation to another one, and sometimes they don't find time to have their lunch or to eat even. And this pressure they live under, and all the causalities they see, all the injuries, the beheaded, the limbs and everything, puts them under very heavy pressure." (Interview 20, 2014)

Participants described the most recent chemical attacks as having a major impact on morale among health workers and their sense of isolation:

"Every single life we saved in the last year ended up dead in the chemical attack. At the end, death has become normal to the rest of the world, no one is reacting." (Interview 1, 2017)

"It had a big effect in creating a hopeless environment, feeling of hopelessness inside each healthcare provider." (Interview 3, 2017)

Participant accounts highlighted the mixed emotions generated by their work, as fear was offset only by a strong sense of professional commitment:

"Sometimes we have depression. But all of us believe that we must do this job – but all of us are afraid of some point where we're injured or killed…" (Interview 13, 2014)

In the absence of external support health workers look to one another; here a participant describes how they rejoice on days where their work does not bring with it the death of another colleague:

"After a barrel bomb falls down we start dancing, the Arabian dancing. We are not dead, and if nobody is dead among us, we start dancing." (Interview 23, 2014)

Finally, another participant pointed to the absence and futility of psychological support and instead the role of their faith:

"What is good about psychological support after all what we have seen? In general, we don't get internal nor external psychological support. The staff that held up for 7 years have only God to depend on." (Interview 2, 2017)

Discussion

Participant accounts are consistent with other documentation, which together reveal that attacks on hospitals and medical providers are targeted and deliberate, and likely constitute war crimes.[1] The data illustrates how violence against health workers and facilties undermined their ability to contribute to the realization of the right to health, which imposes on States a number of core obligations to respect, protect and fulfill the health needs of the population, obligations that are non-derogable, even in times of conflict.[19,20] The attacks have had far reaching implications beyond the observable violence of the destruction of and damage to health care facilities.

As has been found in other conflicts,[16,21-23] our findings show that in Syria violence against health care has bred a climate of fear and insecurity, with devastating impacts on health-seeking behaviors and access, as civilians face difficulties in accessing health facilities, or choose to avoid them altogether. Participants described how their work to treat a suffering population was severely impeded by a lack of availability of essential equipment, facilities and treatments for chronic and infectios disease. Despite their often heroic efforts, they remain ill-equipped to respond as they believe required to the use of chemical agents as a weapon of war that endangered and killed patients and providers alike. The challenges of maintaining standards of quality, interconnected to access and availability, was a central theme of the interviews and constitutes a daily source of pressure and anxiety for those trying to provide care. Shortages in staff and equipment, overwhelming numbers of patients, and the limited capacity of field hospitals has made triage decisions impossibly hard, and coping with the large scale of chemical weapons attacks in facilities already compromised by violence agains them has overwhelmed medical staffs. Participants reported severe difficulties in meeting their responsibilities to provide patients with quality care while still maintaining their own safety, especially during the chemical attacks of 2017. Despite efforts by many organisations to provide supplies, equipment and a safe

environment, health workers have been forced to operate in conditions well below any standard of quality that existed prior to the conflict. The chemical attacks in 2017 show the extent to which the use of prohibited weapons and extreme resource limitations impair health worker efforts to provide care.

Research on the effects of the Syrian conflict has described the lasting impact the migration of health workers on health systems and, ultimately, the civilian population remaining in Syria.[11,14,24] Accounts from both 2014 and 2017 highlight the continued outward migration of health providers due to violence against them, fear and the psychological toll taken by working in these circumstances . They also reveal how physician shortages have led to and self-training in specializations for which doctors on the ground have no official certification. The need for medical personnel to act beyond their training inevitably has implications for the quality of care patients receive, and puts health providers not adequately trained under enormous pressure.

Since we conducted interviews in 2014, attacks on hospitals and health care workers have escalated further, leaving health infrastructure in much of opposition-held areas devastated, forcing more health workers to flee and leaving those who remain subject to dangers of ongoing violence while having inadequate resources to respond to patient needs despite the efforts of humanitarian organisations to fill the gap. The augmented findings from the 2017 chemical attacks illustrate the severity of conditions on the ground. The UN Security Council has called on Syria to adhere to its legal obligation not to attack health facilities and health workers,[25] to no avail, and efforts by members of the Council to refer gross violations of international humanitarian law, including targeting of hospitals and health workers, to the International Criminal Court, were blocked by Russia.

This study shows how important it is both to protect health workers in war and to focus on the needs of health workers who struggle to continue to fulfill the right to health through the war, even while under attack. Those needs include: capacity building to respond to chemical attacks, including provision of correct antidotes, removing barriers to accessing professional training abroad, and research informed trainings to ensure the provision of appropriately equipped psychologists and mental health supporters to provide care to healthcare workers. Finally, future research should continue to evaluate the staggering challenges faced by Syria's health professionals, affording them the opportunity to share their experience and knowledge.

Limitations

The findings are subject to a number of limitations. The majority of participants were in Gaziantep for SAMS trainings in October 2014, and therefore data are limited to the experiences of a sample of health workers, collected within a short five-day period. The potential for respondent bias is also acknowledged. Additionally, the situation in northwest Syria has changed and worsened since this data was collected. For this reason and to reflect more recent events the research team were able to include updated data from health workers currently working in Syria. Collectively these accounts provide an opportunity to learn more in-depth details of the experiences of health workers operating in the Syrian conflict, to understand challenges to health care provision, and to consider ways in which research can begin to support these providers.

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Author's contributions

KF and LR designed and conceptualized the study. LR, DR and ZS coordinated and carried out data collection. KF, EC and LR analyzed and interpreted the data and jointly contributed to writing the manuscript. All authors reviewed the final manuscript.

Competing Interest

The authors declare the following competing competing interests. Dr. Rubenstein reports grants from MacArthur Foundation for the conduct of the study; grants from Oak Foundation, grants from JK Kellogg Foundation, grants from Polak-Mainz Stichting, outside the submitted work; and Chair, Safeguarding Health in Conflict Coalition.

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Transparency declaration

The lead author* Katherine Footer affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Data Sharing Statement: All available data can be obtained from the corresponding author.

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Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Pg. 6
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Pg. 7-8
Purpose or research question - Purpose of the study and specific objectives or questions	Pg. 4
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Pg. 4
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Pg. 3-4
Context - Setting/site and salient contextual factors; rationale**	Pg. 3
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Pg. 3-4
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Pg. 4-5
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Pg. 4

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Pg. 4
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Pg. 5
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Pg. 4
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Pg. 4
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Pg. 4

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Pg. 16-18
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	N/A

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Pg. 17-18
Limitations - Trustworthiness and limitations of findings	Pg. 16-17

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Pg. 19
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Pg.19

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

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Qualitative accounts from Syrian health professionals regarding violations of the right to health, including the use of chemical weapons, in opposition-held Syria

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Abstract

Objectives: To explore the impact of the conflict, including the use of chemical weapons, in Syria on health care through the experiences of health providers using a public health and human rights lens.

Design: A qualitative study using semi-structured interviews conducted in-person or over Skype using a thematic analysis approach.

Setting: Interviews were conducted with Syrian health workers operating in opposition-held Syria in cooperation with a medical relief organization in Gaziantep, Turkey.

Participants: We examined data from 29 semi-structured in-depth interviews with a sample of health professionals with current or recent work-related experience in opposition-controlled areas of Syria, including respondents to chemical attacks.

Results: Findings highlight the health worker experience of attacks on health infrastructure and services in Syria and consequences in terms of access and scarcity in availability of essential medicines and equipment. Quality of services is explored through physicians' accounts of the knock-on effect of shortages of equipment, supplies, and personnel on the right to health and its ethical implications. Health workers themselves were found to be operating under extreme conditions, in particular responding to the most recent chemical attacks that occurred in 2017, with implications for their own health and mental wellbeing.

Conclusions: The study provides unique insight into the impact war has had on Syrian's right to health through the accounts of a sample of Syrian health professionals, with continuing relevance to the current conflict and professional issues facing health workers in conflict settings.

Strengths and Limitations of the Study

- This study uniquely explores the experiences of health care providers providing health care during the current conflict in Syria.

- The study revealed the ways in which the conflict has impacted health providers' ability to provide health care in accordance with patients' right health.
- The findings have implications for capacity-building within humanitarian organizations to counter the challenges faced by Syria's health professionals.
- Interviews were limited to the experiences of a small sample of health workers working in opposition-held regions of Syria, including survivors of chemical attacks.

1. Background

The ongoing civil war in Syria has created one of the direst humanitarian crises of our time.[1,2] Syria's health care system has been decimated and the healthcare community targeted as part of an ongoing military strategy by the Syrian government, now supported by Russian air power.[2] Initiatives exist to assist health providers operating in insecure environments,[3,4] including intense advocacy against increasing attacks on healthcare in conflict settings. However, only a small body of research studies[5] have unpacked the operational, professional, and personal challenges health providers face, and none in Syria. In light of the recent allegations of chemical weapon use throughout Syria and the intimidation of medics speaking out by the Syrian government, the perspectives of healthcare workers could not be more pressing.[6,7]

Human rights organizations and UN agencies have placed a spotlight on the Syrian government's assault on health care.[6,8-14] Physicians for Human Rights documented 478 attacks on medical facilities and the killing of 830 medical personnel since the start of the conflict in 2011, the vast majority by the Syrian government and allied forces.[8] Through to December 2017 Syria has experienced 492 separate attacks on health facilities,[15] while at the commencement of this research in 2014, 58% of hospitals throughout Syria were either not functioning or were restricted in their ability to provide services.[16] This number reflects healthcare facilities in the Aleppo, rural Damascus, Homs, Dara'a, and Deir-el Zor governorates. The World Health Organization has reported severe shortages of medical supplies, scattered vaccination coverage, lack of capacity to address severe health needs and a critical shortage of health providers in Syria.[15] In addition, medical providers have had to respond to the unprecedented use of toxic chemical agents used against civilians since the commencement of the war in December 2012, including a UN-confirmed sarin gas attack in April 2017 in Syria's northern Idlib province[17] as well as persistent allegations of chlorine gas and sarine-use in Eastern Ghouta,[18,19] Syria throughout 2017 and 2018.[17,20,21]

In Syria the health care context is currently made up of three separate health 'systems': the first is run by the Syrian government and is restricted to areas it controls; a second system is comprised of an ad hoc collection of local and international non-governmental organisations (NGOs), local committees, and relief agencies operating primarily within opposition-controlled areas; and a third system is maintained by the Islamic State (ISIS) in areas it controls.[22] One of

these organizations is the diaspora Syrian American Medical Society (SAMS),[23] a consortium of Syrian-American health professionals founded in 1998 as a professional society for networking for physicians of Syrian descent. In 2011, SAMS extended its capacity as a non-profit organisation in response to the Syrian crisis to provide support to healthcare staff and facilities, including providing aid and medical resources in hard-to-reach areas throughout Syria as well as ongoing training for healthcare professionals throughout the conflict. SAMS' operations are mainly in non-government controlled areas, including besieged areas, in northern and southern Syria.

Health care workers operating within opposition-controlled areas have struggled to provide services in the midst of a multi-dimensional crisis.[24] A protracted war on healthcare infrastructure has led to inadequate access to basic necessities and a unprecedented humanitarian crisis.[25-29] It is in this setting that health providers must make daily decisions at the micro, meso, and macro-level of healthcare provision (e.g., who receives care, which hospital to repair, where to target supplies). Conversely, in government controlled areas the health care system has a premium on servicing its forces, with few health resources available for the civilian population, and coerced medical staff to remain and treat them.[30]

Obligations under international humanitarian law include requirements not to attack or interfere with health care services.[31] According to the Geneva Conventions, parties to a conflict are obligated to "respect and protect" wounded and sick people as well as medical facilities, personnel and transports. They must not directly attack them and are required to take steps to ensure that combat operations distinguish between military and civilian objects.[32-34] Further, health professionals may neither be punished for engaging in actions incompatible with medical ethics, nor compelled to do so.[34] The bombing and use of chemical weapons against hospitals, use of missiles and sniper attacks on ambulances, and arrest and torture of health workers for impartial care, all violate these obligations and constitute war crimes.[30]

Human rights obligations can be applied to health systems, including those in conflict, as an analytical tool to help better articulate and understand the responsibilities of states to respect – to refrain from directly interfering with a right; to protect – to prevent third-party interference with the enjoyment of a right; and to fulfil – to take steps to ensure the fullest possible realisation of a right.[31] The right to health, as defined by Article 12 of the International Covenant of Economic, Social and Cultural Rights (ICESCR) and further articulated by UN Committee on

Economic, Social and Cultural Rights in its General Comment 14, presses upon states the obligations under the right to ensure the availability, accessibility, acceptability and quality of health facilities, goods and services.[35] This study explores the complex challenges health workers face in providing care when health care services and personnel are themselves subjected to violence and forced to operate in the midst of ongoing human rights violations and war crimes.

2. Methods

Qualitative research was conducted in October 2014 in Gaziantep with Syrian health workers attending a SAMS training in Turkey and on a separate occasion in July-August 2017 using secure online communication application with health care providers working in areas throughout Syria outside of government control. The study sought to: 1) describe attacks and interferences with healthcare occurring in opposition-controlled areas of Syria; and 2) explore the challenges health workers face and the consequences for civilians' right to health and 3) to include the particular challenges faced by health workers who have responded to chemical attacks in northern Syria.

2.1. Setting

The majority of the qualitative fieldwork was collected in Gaziantep, Turkey, a city 97 kilometers north of Aleppo, Syria, Gaziantep is host to Syrian and international NGOs, and is a humanitarian hub for cross-border support. Among the Syrian NGOs operating out of Gaziantep is the Syrian American Medical Society (SAMS), who partnered with the Johns Hopkins Bloomberg School of Public Health (JHSPH) on this project. SAMS provides routine medical trainings in Gaziantep for health professionals operating inside Syria, providing researchers the unique opportunity to speak directly to field staff with cross-border access.[36] While the majority of the data was collected in-person in Gaziantep during the medical training in 2014 (N=24), separate interviews (N=5) were conducted with different sample of health professionals inside Syria via Wire, a secure online communication tool similar to Skype, in 2017 to understand the effect of the continuing violence inside Syria on healthcare; namely, the chemical attacks that occurred in early April of 2017 in Khan Sheikhoun, a province of Idlib in northwestern Syria.

2.2. Study Population

All participants were identified through purposive sampling methods, taking account of key informants' specialized knowledge and unique perspectives. Eligibility criteria required participants to be aged 18 years or older and a qualified health professional (formally-trained doctors, nurses, dentists, and laboratory, anesthesiology and surgery technicians) with current or recent work-related experience in opposition-controlled areas of Syria. Participants were told the purpose of the study and how the information provided would be used and that participation was voluntary. Permission was sought and in all but one case granted for audio recording; no names or other identifiers were collected. With the exception of respondents who were fluent in English, interviews were conducted in Arabic either through an Arabic translator or Arabic-speaking interviewer. The 2014 interviewer (LR) concluded with a final sample of 27 when no new themes emerged. Three of the interviews conducted were excluded from this analysis due to poor audio quality, incomplete interview, or declining audio recording. The respondents included 18 physicians (14 surgeons, one cardiologist, two anesthesiologists, and one pediatrician), three nurses, three dentists, and the remaining three were laboratory, anesthesiology, and surgery technicians. An additional 5 interviews with new participants were conducted in 2017 by an Arabic speaking interviewer (DR) to address experiences of medical staff (two surgeons, one pharmacist, one anesthesiology technician, and one nurse) inside Syria following a major chemical attack in northwestern Syria. Audio-recordings were transcribed verbatim and triangulated with additional notes.

2.3. Measurement and Analysis

Interviews followed a semi-structured interview guide that was developed in accordance with the aims of this study. This analysis reviews the challenges health care providers face and the constraints on patient care when approached through a right to health lens with a focus on: *Availability*, understood as a functioning public health and health care facilities, goods, and services, to include adequate hospitals and clinics, trained health care professionals, and essential medicines; *Accessibility*, the requirement that health facilities, goods, and services be within safe physical reach for all sections of the population; and *Quality*, the entitlement that health facilities, goods, and services must also be scientifically appropriate and of good quality, to include skilled medical personnel, scientifically approved and unexpired drugs and hospital equipment.[35]

Two independent reviewers (EC, KF) conducted the coding and analysis using an inductive and deductive approach to coding that relied on a priori topics, while still allowing for the emergence of new themes through a process of thematic analysis.[18] First, researchers read through the transcripts to familiarize themselves with the data, three transcripts were then open-coded to delineate established and emergent categories. Coding categories were based on a priori topics around the right to health, and new concepts that emerged from the data. The researchers compared coded transcripts to identify discrepancies and further define the coding scheme. The codes were reviewed by KF, EC, and LR. Clean transcripts were imported into Hyperesearch 3.7.2 and coded using the final scheme developed by the analysts.

2.4. Ethical Approval

The JHSPH Institutional Review Board and a local review board approved research protocols for the 2014 and 2017 interviews. Study participants provided informed consent to be interviewed. All participants in accordance with IRB procedures were explained the purpose of the research, were free to decline to participate, and told of their liberty to withhold information they were uncomfortable to give. Finally, we assured and accorded them privacy, anonymity, and confidentiality.

2.5 Patient and Public Involvement

No Patients or members of the public were involved in the conduct of this research.

3. Results

Findings from this study highlight major gaps in the availability, accessibility and quality of care available in large areas of Syria most effected and besieged by the ongoing conflict. An emergent theme related and connected to quality of care was the presence of acute mental health stressors and demoralizing working conditions impacting on the well-being of health providers in this setting. Despite this, results point to key ways in which health providers on the ground have taken steps to fill these gaps so that civilians can continue to receive life-saving care.

3.1. Sample characteristics

Of the 29 participants in this sample, all but two were Syrian male health professionals. This is mainly due to the lack of female health professionals at the medical training in 2014, and the lack of female participants volunteering information for the 2017 interviews. The non-Syrian health professionals were female Americans who had recently worked in Syria, and were interviewed in 2014. The respondents had varied experience levels and medical professional backgrounds and had experience working in occupation-controlled areas of northwest Syria (exact governorates excluded). (Table 1) Below we present key findings emerging from our analysis of accounts of medical professionals in Syria.

Table 1 – Participant Demographics

Total Participants		29
Gender		
	Male	27
	Female	2
Nationality		
	Syrian	27
	American	2
Profession		
	Surgeon	13
	Cardiologist	1
	Anesthesiologist	2
	Pediatrician	1
	Nurse	4
	Dentist	2
	Technician	4
	Health Co-ordinators	2

3.2. Availability

The targeting of hospitals and ambulances in opposition-controlled and besieged areas has dramatically decreased the availability of health care. Participant descriptions capture both indiscriminate and targeted attacks, including the use of mortar shells, TNT barrel bombs and nerve agents, often with multiple attacks on the same facility. A participant described constant bombardment of a hospital in Latakia:

"Interviewer: How many times has the hospital been hit in three months?

Respondent: Almost 90 times. It's on a daily basis…. The furthest time was 100 meters. Sometimes it's 10 meters, 15 meters away from the hospital." (Interview 8, 2014)

Health care workers have responded to the constant attacks and attempts to obliterate healthcare availability by developing methods to protect themselves, their patients, and their equipment. In response, nearly all participants described a common strategy of placing hospitals underground. However, doctors explained that even fortified hospitals underground or in a cave are vulnerable, in particular if exposed to a chemical attack, especially to heavy sarin gas:

"We operate in a fortified hospitals underground, but with chemical attacks all hospital are susceptible to the chemical attacks and getting destroyed." (Interview 1, 2017)

The ongoing conflict has restricted movement and limited the availability of health supplies. Medicines and equipment for trauma cases, the management of chronic diseases, and treatable childhood diseases were highlighted as being in short supply:

"Because there are no vaccinations we now see polio and measles. All these diseases are different, some diseases need specific medication, and we haven't any." (Interview 12, 2014)

In particular participants describing the medical response to the 2017 chemical attacks, highlighted that hospitals lacked sufficient supplies of appropriate antidotes to treat the nerve agent(s) civilians were exposed to:

"Our hospital wasn't equipped to treat chemical attacks, since we thought that chemical weapons were eradicated since 2013. Back then we brought big amount of Atropine to treat chemical attack victims but the medication expired and we never used it." (Interview 1, 2017)

The provision of medical supplies and medications, including protective equipment for chemical attacks, improved by 2017 through the work of humanitarian organisations. However, all participants described the continued scarcity of life-saving protective equipment and inadequate availability of specialist care. Given the high volume of serious traumatic injuries, availability of essential equipment and qualified physicians is essential to protect the right to health of those injured by conflict. However, in the absence of resources and training participant accounts highlighted altered standards of care implemented to preserve life:

"Lack of surgeons caused many cases to either be amputated after treatment, resulting in death or complications. A lack of instruments for orthopedic and neurosurgery have also caused many complications. Despite this difficult reality, we are still doing 4,500 surgeries each month." (Interview 2, 2014)

With respect to the chemical attacks, healthcare workers were also placed at increased risk of harm due to the lack of availability of appropriate safety equipment when treating patients exposed to chemical agents:

"Honestly, we still haven't received fully protective equipment. When the medical staff were affected and we saw how people were getting affected even when they thought they were protected ... this is when we started using masks. But even masks weren't good enough..." (Interview 2, 2017)

3.3. Accessibility

Attacks on hospitals during the 2017 sarin attacks limited patient access to hospitals at precisely the moment that it was most critical:

"We witnessed the aircraft striking the city 6 times, firing exactly 11 missiles. Once the aircraft were gone, we went to the hospital and we saw that the air strikes were targeting the hospital where the chemical attack victims were transferred to get treatment. By the time we arrived at the hospital, we found that all the staff had fled from fear, and a big part of the hospital was destroyed. One patient was undergoing a surgery, his blood was still on the operating table." (Interview 3, 2017)

Even in cases where hospitals are not completely destroyed the impact of bombardments on health care access is profound, with many participants describing regular interruptions and closures. Fear of attacks on hospitals has an indirect but major impact on patient access to health services. As a participant explained:

"Lots of people don't dare to go to the hospital, because they know that the hospital has been targeted by the bombardment – five, six times. It's only those who are in grave need who will go to the hospital." (Interview 11, 2014)

For civilians who have been injured in attacks or who are unable to travel to a hospital for other reasons, medical care access is dependent on first responders or civilian transportation. However, ambulances are in short supply, in part due attacks on them, and the risk to first responders is great, as they are easy targets for aerial attacks:

"There were many cases when ambulance drivers have been attacked, especially at night in the dark. The aircraft see the lights of the ambulance and attack it." (Interview 2, 2014)

At times of acute crisis, such as the recent chemical attacks, lack of prompt access to facilities owing to long transport times and restricted capacity, has meant many additional civilian fatalities:

"There is no clear strategy for the health system tactically or operationally to deal with the number of injuries, and nerve injuries are a new topic for us. If there had been a medical point nearby, maybe one or two kilometers away from our hospital, we would have saved a lot of people." (Interview 5, 2017)

Finally, the difficulties and dangers of transporting supplies and equipment into besieged areas was highlighted as another access issue that poses severe risks for health workers. One participant reported that 28 staff from their hospital had been arrested while attempting to carry medicines and supplies to their hospital:

"Taking medicine into [town name], is a crime that is punished…they go to prison and nobody knows after that, of course it's torture." (Interview 7, 2014)

3. 4. Quality

Makeshift hospitals (known as field hospitals) emerged in opposition-controlled areas as a result of the assault on health infrastructure in rebel held areas of Syria, replacing hospitals and clinics formerly serving Syria's population. These field hospitals are located in former factories, farms, and schools. Although Syrian health workers and their supporters provide supplies and equipment to these field hospitals, in many of them it is extremely difficult to maintain standards of care, especially at times of mass casualties from attacks, as evidenced in participant descriptions:

"Everything is allowed in a field hospital. You can put the intravenous line in with alcohol - we do it all the time. You can do operations without sterilized matters, without anesthesia machines." (Interview 15, 2014)

During the 2017 chemical attacks, some hospitals that had been closed-down for safety reasons were reopened to deal with the overwhelming number of casualties:

Most of the hospital was destroyed by an attack on [date excluded] *and it was out of service, but because the other hospital couldn't deal with the large number of patient, they reactivated the emergency department. Even though it was very risky, just so they could receive some patients.* (Interview 3, 2017)

Participants also reported that because of the high number of trauma cases, patients with other medical conditions were often left untreated. During the chemical attacks, triage decisions led to a lack of attention to the most vulnerable, including large numbers of affected children. Participants' accounts highlight that medical personnel such as dentists and anesthesiology technicians are acquiring new skills to meet the chronic shortage of surgeons and

anesthesiologists, because so many health workers have fled Syria. Here a participant describes how they performed a surgery without previous training:

*[*Interviewer: *Part of your training was in that kind of surgery?] "No, it was just a minimal part of it, I was given just an overview of these types of surgeries, but out of necessity I've had to do these surgeries."* (Interview 1, 2014)

Participants involved in treating patients in the most recent chemical attacks were frank in describing how ill prepared the medical sector has been, with training and equipment inadequate to meet the demands of the overwhelming crisis. This resulted in a highly variable quality of care at medical facilities:

I think that medical providers barely saved 1-2% of the chemical attack victims, because the situation is totally different. We have no prior training, medical staff or equipment to deal with it. I believe that what we were able to provide was too little. (Interview 1, 2017)

The continued outward migration of healthcare providers from Syria, and resulting shortage in quality clinical care has also been exacerbated by the relentless targeting of healthcare services and recent chemical attacks:

"Some healthcare providers decided to stay in Turkey and not to go back to Syria until things are clearer, others said that the use of chemical weapons is something that will never stop. We won't be able to provide much and we might turn into patients ourselves, so medical staff were evaluating how beneficial they can be over there." (Interview 3, 2017)

3.5. Health Worker Demoralization

The constant attacks to health infrastructure and the barriers to health care access, availability, and quality that result, impact not only civilians who seek treatment but also the health workers who provide care. Interviews highlighted a complex constellation of factors that impact health workers' day to day working conditions. As this participant described:

"You are working with bad health supplies and instruments, and short of financial support. We also have a great danger of being killed because of the constant bombings. All those factors put a great pressure on doctors... Especially the doctors that work for health organisations and in the opposition areas, they are under focus from the regime." (Interview 2, 2014)

Conditions remain violent, with participants interviewed following the 2017 chemical attacks drawing attention to the rising death toll among doctors and enduring sense of fatalism among those who remain:

The past year Dr. [name and date omitted] *passed away* [exposed to chemical agents while treating a patient] *and another anesthesiologist passed away. There have been about 5-6 deaths from our medical staff within the organization. The truth is that work in the northern countryside is considered suicide. (Interview 5, 2017)*

The stress of providing care during war is made worse because of the scarcity of health workers. Many participants reported that they work 24-hour days because there are no other staff to relieve them of their duties. Additionally, participants described often feeling helpless, because of the number of people they could not assist. A participant explained health worker's relentless workload, coupled with the extreme trauma related injuries they respond to:

"Sometimes it takes them from 8:00 in the morning till 12:00 in the evening doing operations only. And because of the lack of the staff they are obliged to stay in the hospital, moving from one operation to another, and sometimes they don't find time to even eat. This pressure they live under, and all the casualties they see, all the injuries, the beheaded, the limbs and everything, puts them under very heavy pressure." (Interview 20, 2014)

Participants described the most recent chemical attacks as having a major impact on morale among health workers and their sense of isolation:

"Every single life we saved in the last year ended up dead in the chemical attack. At the end, death has become normal to the rest of the world, no one is reacting." (Interview 1, 2017)

"It had a big effect in creating a hopeless environment, feeling of hopelessness inside each healthcare provider." (Interview 3, 2017)

Participant accounts highlighted the mixed emotions generated by their work, as fear was offset only by a strong sense of professional commitment:

"Sometimes we have depression. But all of us believe that we must do this job – but all of us are afraid of some point where we're injured or killed…" (Interview 13, 2014)

In the absence of external support health workers look to one another; here a participant describes how they rejoice on days where their work does not bring with it the death of another colleague:

"After a barrel bomb falls we start dancing, the Arabian dancing. We are not dead, and if nobody is dead among us, we start dancing." (Interview 23, 2014)

Finally, another participant pointed to the absence and futility of psychological support and instead the role of their faith:

"What is good about psychological support after all what we have seen? In general, we don't get internal nor external psychological support. The staff that held up for 7 years have only God to depend on." (Interview 2, 2017)

Discussion

To the authors' knowledge, this is the first research study to illuminate the experiences of indigenous health workers in Syria seeking to provide health care to the local population, while themselves under attack. Unlike international aid workers, whose experience have been extensively studied, local doctors, nurses and other health workers who remain in their country to try to relieve suffering have received far less attention in the context of research. This qualitative study of 29 health workers subjected to bombing and chemical attacks provides new insights into the overwhelming challenges they face, their persistence in trying to meet them, and the psychological toll of carrying on. The bombing and chemical attacks have had far reaching implications beyond the observable violence and destruction of health infrastructure. These include the flight of health workers from Syria, even as population needs increase, reluctance of patients to seek needed care in hospitals, and allocation of resources needed for care to protection and security.

Attacks on hospitals, ambulances, health workers, and the wounded and sick are not uncommon in armed conflict. In 2016, for example, such attacks took place in 23 countries, and bombing and shelling took place in ten of them.[9] Syria is unique, in part because of the number of sustained attacks on hospitals now numbering over 500 over a period of seven years, alongside the rising number of chemical attacks.[37]As has been found in other conflicts,[31,38-40] our findings show that in Syria violence against health care has bred a climate of fear and insecurity, with devastating impacts on health-seeking behaviors and access including, civilian difficulties in reaching medical aid or avoidance of health facilities altogether. Participants described how their work to treat a suffering population was severely impeded by a lack of availability of essential equipment, facilities, and treatments for chronic and infectious disease.

The challenges of maintaining standards of quality, interconnected to access and availability, was a central theme of the interviews, and constitutes a daily source of pressure and anxiety for those trying to provide care. Health care providers have had to cope with shortages in staff and equipment and overwhelming numbers of patients, rendering triage decisions impossibly hard. The large scale of chemical weapons attacks in facilities already compromised

by violence against them has overwhelmed medical staffs. Despite efforts by many organisations to provide supplies, equipment, and a safe environment, health workers have been forced to operate in conditions well below any standard of quality that existed prior to the conflict. The chemical attacks in 2017 in particular show the extent to which the use of prohibited weapons and extreme resource limitations impair health worker efforts to provide basic life-saving treatment, and the extreme threats posed to their own safety and wellbeing.

Organizations supporting medical care in Syria, such as SAMS, have responded to the crisis by providing training to health professionals on trauma care and response to chemical weapons attacks, offering protective equipment, antidotes for chemical attacks, and constructing health facilities underground to protect them from bombs. These efforts, however, inevitably have limited impact in the face of the level of violence inflicted on health facilities and health workers. As one 2014 respondent said when asked what could be done to offer health workers in Syria support, he replied, "*Stop the bombing*." Only concerted action by the international community through the UN Security Council or otherwise could achieve that, and it has not been forthcoming over seven years of conflict. Research on the effects of the Syrian conflict has described the lasting impact the migration of health workers on health systems and ultimately the civilian population remaining in Syria.[25,28] Accounts from both 2014 and 2017 highlight the continued outward migration of health providers due to violence against them and the psychological toll taken by working in such circumstances. They also reveal how physician shortages have led to the self-training in specializations for which doctors on the ground have no official certification. The need for medical personnel to act beyond their training inevitably has implications for the quality of care patients receive, and puts health providers not adequately trained under enormous pressure.

Participant accounts are consistent with other evidence, which together reveal that attacks on hospitals and medical providers are targeted and deliberate, and likely constitute war crimes. The data illustrates how violence against health workers and facilities undermined their ability to contribute to the realization of the right to health, which imposes on States a number of core obligations to respect, protect and fulfill the health needs of the population, obligations that are non-derogable, even in times of conflict.[41,42] Syria has ratified the International Covenant on Economic, Social and Cultural Rights, and even though Syria does not control all areas of the country, it has an obligation both to refrain from taking actions to infringe the right to health and

take affirmative steps to protect health workers and individuals seeking health care in those regions.[42] Instead, the government is attacking hospitals and health workers, with UN human rights agencies continuing to confirm the severity of its violations of these rights.

Since we conducted interviews in 2014, attacks on hospitals and health care workers have escalated further with augmented findings from the 2017 chemical attacks illustrative of the severity of conditions on the ground. Chemical weapons have continuously been used by the Syrian government and its allies throughout the conflict, as confirmed by the United Nations chemical weapons watchdog, the Organization for the Prohibition of Chemical Weapons (OPCW).[17] The UN Security Council has repeatedly called on Syria and its allies to adhere to its legal obligation not to attack health facilities and health workers,[43] to no avail, and efforts by members of the Council to refer gross violations of international humanitarian law, including targeting of hospitals and health workers and the use of chemical weapons on civilians, to the International Criminal Court, were either blocked or denied by Russia.

Conclusion

This study shows the consequences for health practitioners who seek to provide medical care for populations where health systems are subjected to bombings and other forms of violence, including chemical attacks. It is remarkable that doctors and nurses continue to work in conditions of such danger, and how they have carried on despite dire shortages of staff and supplies. While they are resilient, they suffer enormously. The study underlines the consequences to health workers of the failure by the international community to take effective action to protect them from aerial assaults, chemical attacks, and other forms of violence. It further underlines the imperative of taking strong steps to protect health workers in war and to focus on the needs of health professionals who struggle to continue to fulfill the right to health, even while under attack.

Those needs include: capacity building to respond to chemical attacks (including provision of correct antidotes and protective gear); removing barriers to accessing professional training (including continuing education abroad); and research informed trainings delivered remotely to ensure the provision of appropriately equipped psychologists and mental health supporters to provide care to healthcare workers. Finally, future research should continue to

evaluate the staggering challenges faced by Syria's health professionals, affording them the opportunity to share their experience and knowledge.

Limitations

The findings are subject to a number of limitations. Firstly, there is the potential for respondent bias (e.g., specific geographic experience or gendered framing) due to a number of factors constraining the pool of available participants. The majority of participants were in Gaziantep for SAMS trainings in October 2014, and therefore data are limited to the experiences of a sample of health workers, collected within a short five-day period, and then later in 2017 to those with specific knowledge of the chemical attacks. Furthermore, most participants were male despite outreach to both male and female health professionals currently inside Syria. This is mainly due to the scarcity of female health professionals attending the 2014 trainings (which includes cultural barriers and travel concerns for women from Syria into Turkey) and the lack of female representatives recommended to interview after the chemical attacks in 2017. To address this concern, future research on healthcare providers inside Syria should aim to include female health workers as well as interview questions that address gender-specific challenges among healthcare workers inside Syria. Additionally, the situation in northwest Syria has changed and worsened since this data was collected. For this reason and to reflect more recent events the research team were able to include updated data from health workers working in Syria in 2017. Finally, these findings do not apply to areas of the country controlled by the Islamic State or to government-controlled areas. In government-controlled areas, the health system is understood to be largely intact, though capacity is variable, and the impact of the war can be felt through indiscriminate mortar attacks, emigration of senior physicians, travel restrictions and inconsistent supplies.[30] However, access of information in these areas is extremely limited for researchers on-the-ground and was beyond the scope of this study. Despite these limitations, collectively accounts provide an opportunity to learn more in-depth details of the experiences of health workers operating in the Syrian conflict, to understand challenges to health care provision, and to consider ways in which research can begin to support these providers.

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Author's contributions

KF and LR designed and conceptualized the study. LR, DR and ZS coordinated and carried out data collection. KF, EC and LR analyzed and interpreted the data. KF led manuscript writing with contributions from LR and EC. All authors reviewed the final manuscript.

Competing Interest

The authors declare the following competing competing interests. Dr. Rubenstein reports grants from MacArthur Foundation for the conduct of the study; grants from Oak Foundation, grants from JK Kellogg Foundation, grants from Polak-Mainz Stichting, outside the submitted work; and Chair, Safeguarding Health in Conflict Coalition.

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Transparency declaration

The lead author* Katherine Footer affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Data Sharing Statement: All available data can be obtained from the corresponding author.

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Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Pg. 1
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Pg. 6
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Pg. 7-8
Purpose or research question - Purpose of the study and specific objectives or questions	Pg. 4
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Pg. 4
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Pg. 3-4
Context - Setting/site and salient contextual factors; rationale**	Pg. 3
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Pg. 3-4
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Pg. 4-5
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Pg. 4

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Pg. 4
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Pg. 5
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Pg. 4
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Pg. 4
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Pg. 4

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Pg. 16-18
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	N/A

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Pg. 17-18
Limitations - Trustworthiness and limitations of findings	Pg. 16-17

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Pg. 19
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Pg.19

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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