

MSF experiences of providing multidisciplinary primary level NCD care for Syrian refugees and the host population in Jordan: an implementation study guided by the RE-AIM framework

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Abstract

Background: In response to the rising global NCD burden, humanitarian actors have rapidly scaled-up NCD services in crisis-affected low-and-middle income countries. Using the RE-AIM implementation framework, we evaluated a multidisciplinary, primary-level model of NCD care for Syrian refugees and vulnerable Jordanians in Irbid, Jordan. We examined the programme's *Reach, Effectiveness, Adoption* and acceptance; *Implementation* and *Maintenance* over time.

Methods: This mixed methods, retrospective evaluation, undertaken in 2017, comprised secondary analysis of pre-existing cross-sectional household survey data; analysis of routine cohort data from December 2014 - December 2017; descriptive costing analysis of total annual, per-patient and per-consultation costs for 2015-2017 from the provider-perspective; clinical audit; medication adherence survey of 300 patients; and qualitative research involving thematic analysis of individual interviews and focus group discussions.

Results: The programme enrolled 23% of Syrian adult refugees with NCDs in Irbid governorate. The cohort mean age was 54.7 years; 71% had multi-morbidity and 9.9% self-reported a disability. The programme was acceptable to patients, staff and stakeholders. Blood pressure and glycaemic control improved as the programme matured and by 7 mmHg and 26 mg/dL respectively within six months of patient enrolment. Total costs increased in parallel with increased service complexity from INT\$ 4,206,481 in 2015 to 6,739,438 in 2017. Staff reported that clinical guidelines were usable and patients' self-reported medication adherence was high. Individual and organisational challenges to programme implementation and maintenance included the impact of war and the refugee experience on Syrian refugees' ability to engage; inadequate low-cost referral options; and challenges of operating in a regulated, middle-income country. Essential programme adaptations included refinement of health education, development of mental health and psychosocial services and addition of essential referral pathways, home visit, physiotherapy and social worker services.

Conclusion: RE-AIM proved a valuable tool in evaluating a complex intervention in a protracted humanitarian crisis setting. This multidisciplinary programme was highly acceptable. It achieved good clinical outcomes but for a limited number of patients and at relatively high cost. We propose that model simplification, adapted procurement practices and use of technology could improve cost effectiveness without reducing acceptability, and may facilitate replication.

Background

In recent years, humanitarian actors have had to rapidly scale-up their NCD services in response to the rising burden of NCDs globally and the increasing number of humanitarian crises involving middle-income countries with high NCD burdens (1,2). While there is strong evidence on cost-effective, primary care-based clinical management of NCDs in stable, high-income countries, the clinical evidence, guidelines and tools available to guide NCD interventions in low- and middle-income countries (LMICs) -

particularly addressing those affected by humanitarian crises and forced displacement - are very limited (3–5). The literature describing NCD programme implementation or evaluation in humanitarian settings is equally limited (6,7). In response, humanitarian actors, including the medical humanitarian non-governmental organisation (NGO) Médecins sans Frontières, have been working to develop clinical and programmatic guidance as well as monitoring and evaluation tools to support NCD care in humanitarian settings. The challenges of evaluating interventions in humanitarian settings are well known (8–11). Traditional experimental methods may be unfeasible or even unethical to implement in such settings. Target populations are vulnerable and humanitarian contexts are dynamic and potentially insecure (9). There may be limited skills, time and funding available for research and evaluation within humanitarian teams. There is a clear need to develop robust strategies to evaluate programmes in disaster settings that are rapid, pragmatic and that impose minimal burden on implementing teams (11). The RE-AIM framework is a commonly used implementation research framework that has been used successfully for planning and evaluating interventions in both high-income and LMIC settings (12). To the best of our knowledge, it has not yet been comprehensively applied to a humanitarian intervention. It was designed to facilitate the translation of research into practice and to improve the reporting of key elements essential for successful programme implementation, at both individual- and organisational-levels (12–16). Using mixed methods, the framework assesses programmes under five key domains: reach, effectiveness, adoption, implementation, and maintenance (Table 1). The Syrian conflict, now in its tenth year, continues to devastate the Syrian people. Since 2011, over 6.1 million Syrians have been internally displaced, while over 6.6 million have fled as refugees, mostly into surrounding countries (17). Jordan currently hosts almost 670,000 Syrian refugees registered with the United Nations High Commissioner for Refugees (UNHCR). Globally, it ranks second only to Lebanon in the number of refugees it hosts relative to the national population (17,18). NCDs have been responsible for more deaths than communicable diseases in Syria for several decades, causing 77% of mortality before the conflict (19,20). Therefore, host country and humanitarian actors have had to tackle the high NCD burden amongst Syrian refugees (18,21–23). In Jordan, the Ministry of Health (MOH) has been strengthening NCD care at primary level to address the rising NCD burden among its own population. At the time of this study, NCDs were diagnosed and monitored by family medicine specialists at MOH comprehensive primary centres while medication refills were provided by non-specialist doctors at primary health centre level. UNHCR funded registered Syrian refugees to access MOH primary care services and limited referral services. However, financial barriers (including the addition of user co-payments from 2014, which have varied over time reaching full “foreigner” rate by 2018), complex care pathways and referral systems, and limited health facility capacity have impeded refugees’ access to these services (24). The burden, access issues and the broader health system response to Syrian refugees’ NCD needs in Jordan are well documented (24–27). However, little is known about the content or quality of current NCD programming, either within the MOH or parallel humanitarian health systems. Since 2014, Médecins sans Frontières (MSF), a humanitarian medical organisation, has supported the Jordanian health system by providing multidisciplinary, primary level NCD care to Syrian refugees and the vulnerable host population in Irbid, north Jordan. In response to the urgent need for evidence to guide humanitarian actors in tackling NCDs in complex settings, we undertook a mixed methods evaluation of the MSF programme. We hoped to learn lessons to both

improve the current care model and to inform the design of future NCD programmes in Jordan and elsewhere. Detailed analyses of cohort, qualitative and costing data are reported in separate papers (28–30). The aim of this paper was to summarise the full evaluation, which used the RE-AIM implementation framework to examine the Reach; Effectiveness; Adoption and acceptance of the programme; Implementation fidelity, adaptations and costs; and programme Maintenance over time (31).

Methods

This retrospective mixed methods evaluation of the MSF NCD programme in Irbid comprised secondary analysis of data from a pre-existing cross-sectional household survey (25), analysis of routine cohort data, a descriptive costing study, a clinical audit, a self-administered medication adherence survey and qualitative research. It was undertaken in late 2017 and covered the study period December 2014 to December 2017. This paper draws together the findings from all methodologies under the RE-AIM framework. Example indicators, based on the RE-AIM domains, and the relevant methods and data used to determine them are presented in Table 1. The full list is available in Supplementary Material 1.

Table 1. Example indicators and data method/source based on the RE-AIM domains

Objective / Domain (Questions)	Sub-Domain	Indicator	Methods (a methodology may feature under several headings)
Reach · Target population reached?	Coverage	§ % people among the target population eligible for programme and number served by the programme § Prevalence of NCD and MH comorbidity*	· Existing MSF household survey ^ · Routine cohort data · Qualitative data
“Effectiveness”/ Quality of Care § Trends in clinical outcomes and quality indicators? § Perceived benefits/unintended consequences from a patient and provider perspective?	Clinical Outcomes	§ % HTN patients with most recent BP ≤ 140/90 mmHg, 6 & 12 months post enrolment and trend from baseline* % Patients with diabetes with last HbA1c < 8.0 % 6 & 12 months post enrolment and trend from baseline* § % Patients who report decreased/quitting smoking	· Routine cohort data · Qualitative data
	Quality Indicators	§ % active [¶] CVD patients prescribed a statin § % COPD/ asthma patients with inhaler technique check documented § Trend in defaulters [¶] as a proportion of active cohort	· Clinical audit · Routine cohort data
	Perceived Effectiveness	§ Patients’ and providers’ perspectives on effectiveness of programme components (clinical review, medications, HE, HLO, MHPSS, HV)	· Qualitative data
Adoption/ acceptance § Care model accessible and	Accessibility/ acceptability	§ Availability and accessibility / barriers to access	§ Routine cohort data § Qualitative data

acceptable to patients, providers, organisation and community?		§ Acceptability/usability of NCD guideline	§ Self-report medication adherence questionnaire
§ Guideline acceptable to staff?		§ Self-reported medication adherence and medication beliefs	
	Adoption/participation	§ Description of intervention location, cadres of staff and qualifications § Experience of receiving and providing NCD care, use of clinical guideline § How participation influenced patient/staff well-being and/or work practices	§ Routine cohort data § Qualitative data
Implementation	Fidelity of programme delivery	§ % DM patients with micro-albuminuria or urinary protein tested § % Active [¶] cohort attending a health education session at last clinical visit § No. of MHPSS group sessions monthly during reporting period	§ Clinical audit § Routine cohort data
§ Intervention delivered as intended?			
§ Facilitators and barriers to implementing the programme?			
§ Essential components and adaptations necessary?			
§ Implementation costs?	Adaptations	· NCD care adaptations to local setting (e.g. cultural; dietary, exercise) · Programme adaptations related to humanitarian setting e.g. response to patients' psychosocial needs	§ Qualitative data
	Cost	· Staff time; · Capital and recurrent implementation costs*	§ Qualitative data § Medicine/supply/ staff costs* § Staff time estimates
Maintenance	Individual Level	· % Patients active [¶]	§ Routine cohort data

<ul style="list-style-type: none"> Challenges and facilitators for patients to stay in programme? Organisational challenges, and costs adaptations to maintain? 		<ul style="list-style-type: none"> 6 months post enrolment* Self-reported medication adherence rates Key challenges in altering lifestyle (diet, exercise, smoking) 	<ul style="list-style-type: none"> § Clinical Audit § Qualitative data § Medicine/supply/staff costs* § Staff time estimates § Self-report medication adherence questionnaire
Organisational Level	<ul style="list-style-type: none"> Measures of cost of maintenance* 	<ul style="list-style-type: none"> Institutionalisation of the programme/modifications made for maintenance 	
<ul style="list-style-type: none"> Alignment with organisational mission 			

Key: BP=blood pressure; COPD=chronic obstructive pulmonary disease; CVD=cardiovascular disease; HbA1c=glycosylated haemoglobin; HLO=humanitarian liaison officer; HV= home visit; MH= mental health; MHPSS=mental health and psychosocial support; NCD=non-communicable disease. ^ Relevant methods and results are reported in Rehr et al (25). * Detailed methods and results are reported in linked papers (30)(28). ¶ “Active patients” means continued to attend the service and not exited [i.e. died, departed the area or defaulted (i.e. have not attended for more than 90 days since their last planned appointment)].

Study setting

The study was conducted in Irbid, the second largest city in Jordan. Irbid governorate hosted over 165,000 Syrian refugees who were mostly urban-based (32). MSF commenced an NCD service within a Ministry of Health (MOH) primary care facility in Irbid in December 2014 serving non-camp dwelling Syrian refugees and the vulnerable Jordanian host community. A second site in the city was opened within a local NGO clinic in April 2016. The MSF service was vertical, operating in parallel to the pre-existing activities at each site rather than integrating with them. The cohort size was capped by MSF at approximately 4000 for operational and cost reasons and the two sites were later amalgamated in 2019.

Intervention

Detailed descriptions of the context, the intervention and a programme timeline are appended in the supplementary material (S2 and S3). In brief, this was a multi-disciplinary, primary care model, which used context-adapted clinical guidelines, generic medications in line with the World Health Organization (WHO) Essential Medicines list and task sharing.

Enrolment. Eligibility for enrolment required both medical and social indications.

The target medical conditions were: hypertension (HTN), established cardiovascular disease (CVD) [angina, myocardial infarction, ischaemic stroke, transient ischaemic attack, peripheral vascular disease, congestive heart failure], diabetes mellitus (DM) type I or II, chronic obstructive pulmonary disease (COPD), asthma or hypothyroidism). Hereafter, these are referred to as “target NCDs”. Social indications included being a Syrian refugee (either registered or unregistered with UNHCR), a refugee of other origin or a vulnerable member of the Jordanian host population.

Jordanians were considered vulnerable if they either lacked Jordanian national health insurance (and were therefore subject to co-payments to access MOH care) or were of low socioeconomic status. This was assessed using “vulnerability criteria” developed by the programme. Enrolment criteria changed over time e.g. isolated hypothyroidism was removed and vulnerability criteria were adapted for ease of implementation. Enrolment was capped at about 4000 active patients and was not limited by place of residence or age. Most patients presented with established, self-reported diagnoses; new diagnoses were made based on the MSF NCD guideline (33).

Service description The multidisciplinary team initially included non-specialist doctors, nurses, health educators, pharmacy and reception staff, who provided appointment-based medical consultation, health education (HE) and behaviour change counselling, supported by a local management team and a coordination team in Amman. The service evolved to also incorporate individual- and group-based mental health and psychosocial support (MHPSS), social work, physiotherapy and a home visit service for house-bound patients, with the addition of counsellors, a humanitarian liaison officer (HLO), a home visit doctor and nurses, a physiotherapist and specialist family medicine practitioners. Facility-based services were provided six days per week from 8 am to 2 pm, while the home visit service operated on six days within a ten-mile radius of the clinics. By 2017, the team had begun to introduce task sharing of reviews for patients achieving clinical control to nurses and to reduce their review frequency from monthly to every three months with monthly medications pick-ups. Further detail is available in Supplementary Material (S2 and S3).

Study Design

For this evaluation, the RE-AIM domains were defined as follows: *Reach* was defined as coverage of the NCD service and its components to the intended target population, with a focus on MHPSS services. RE-AIM defines *Effectiveness* as the impact of an intervention on important outcomes, including potential negative effects, quality of life and costs. *Effectiveness* was determined by examining: 1) trends in intermediate clinical outcomes, 2) quality of care indicators, 3) perceived benefits, unintended consequences and behavioural outcomes, and 4) economic outcomes. *Adoption / acceptance* were explored in relation to the organisation, setting, staff and patients and included changes to behaviour and practice. *Implementation* of the NCD service was explored in relation to each programme component. We examined the fidelity of guideline implementation and its usability; the adaptation of structures, processes and tools; and the costs of implementation. *Maintenance* referred to the continued implementation of the NCD service over time by patients, the programme team and the organisation. The specific indicators and methodologies used to operationalize these definitions are listed in Table 1 and Supplementary Material 1. Qualitative and quantitative data from the various data sources were synthesized using the RE-AIM framework.

Study participants, data collection and analysis

Household survey: To explore programme coverage, we used previously reported data from a Household Access and Utilisation Survey conducted by MSF in Irbid governorate, north Jordan in 2016. MSF undertook the survey to inform health service planning for the refugee population. They estimated the prevalence of NCDs and NCD multi-morbidity and determined factors associated with high NCD prevalence. Data collection and analysis, using a two-stage cluster design, are described in detail elsewhere (25).

Retrospective cohort study: To explore cohort demographics, NCD prevalence and service use, we analysed data from all patients who ever attended an enrolment visit in MSF's NCD clinics from December 2014 to December 2017. Descriptive statistics were used to examine patient demographics and process indicators. We explored trends in intermediate clinical outcomes and treatment interruption from programme and patient perspectives, and the factors associated with these trends. We included patients 18 years and older with hypertension and/or diabetes type II (DM II), exploring control of systolic blood pressure (SBP<140 mmHg) and glycaemia [fasting capillary blood glucose (FBG) \leq 180 mg/dL or HbA1c < 8%] (30). We plotted monthly means for each outcome (SBP, FBG, HbA1c or treatment delay) and the proportion of monthly visits at which targets were achieved. We used Generalised Linear Mixed-Effects Models (GLMM) to explore factors associated with each outcome. The analysis is elaborated on in our related paper (30). Routine paper-based clinical data were collected by MSF data clerks and entered into a bespoke password-protected Excel software database. Cohort data from both clinical sites were aggregated and analysed using R v1.0.136 (R, Boston, MA 02210, USA).

Costing study: A descriptive costing analysis from the provider perspective aimed to explore the annual total, per patient and per consultation costs for the Irbid NCD programme for 2015, 2016 and 2017. The analysis delineated capital and recurrent costs incurred at clinic- and project team-levels in Irbid and coordination team-level in Amman. Recurrent costs included human resources, medicines and equipment, building and vehicle costs, and training and supervision. We excluded direct or indirect patient-incurred costs. The analysis is described in detail in our companion paper (28).

Clinical audit: The clinical audit aimed to explore programme quality by examining fidelity of guideline implementation. We used a random selection of paper files from patients enrolled at least 12 months in the programme. Data were collected in August 2017 by programme medical staff on a paper-based checklist and entered into a purpose-designed Excel spread-sheet. We used process indicators analysed using descriptive statistics (Table 1; S1)

Medication adherence survey: A convenience sample of 300 consenting patients aged 18 or over attending either MSF clinic site during a 2-week period in September 2017 was selected (Supplementary material S4). The 17-item adherence survey included demographic information and pre-existing self-reported medication adherence and beliefs measures: the Medication Adherence Report Scale-5 item (MARS-5) and the Beliefs About Medicines Questionnaire (BMQ). Two trained data collectors took written informed consent from patients, who self-filled the survey in Arabic. Data collectors assisted those with limited literacy. Paper data were held securely and were entered into a purpose-designed excel tool. Analysis included descriptive statistics and multivariate logistic regression.

Qualitative study: The methods are described in detail in Supplementary material S5. In brief, this involved two same-sex focus group discussions (FGDs) with eight Syrian adult patients each and forty individual semi-structured interviews (SSI), including sixteen with adult Syrian and Jordanian patients, eighteen with MSF staff, and seven with key stakeholders. Data were collected by two local researchers and the principal researcher, in Arabic and English, in August 2017. Thematic analysis based on the RE-AIM framework, using a combination of inductive and deductive coding, was done by EA and a second analyst (LM).

The findings are reported in accordance with the Consolidated Criteria for Reporting Qualitative Research checklist for transparency (34). Mental health and social suffering emerged as prominent, data-derived themes and have been reported in detail separately (29). The remaining themes are reported here.

This study protocol was granted approval by the MSF Ethics Review Board and LSHTM Ethics Committee. Written authorisation to implement the study was obtained from the Ministry Of Health of Jordan.

Results

The results are presented according to each RE-AIM domain and subdomain (Table 1). These have been somewhat reordered to facilitate logical presentation.

Reach

We explored the numbers eligible for the programme, numbers reached and representativeness of those reached. According to MSF's Household Access and Utilisation Survey (2016), one fifth of surveyed adult Syrians self-reported at least one NCD targeted by MSF (21.8% of 8041 surveyed adults aged 18 or over). UNHCR and others estimated that 95% of refugees resident in Irbid governorate in 2017 were registered with UNHCR (n=135,144 in December 2017) of whom 48.7% were adults aged ≥ 18 years (25,35). This implies there were 141,901 total refugees with 69,106 ≥ 18 years. Applying the household survey figure of 21.8% meant 15,065 Syrian refugees ≥ 18 years in Irbid governorate had an MSF-targeted NCD and were therefore eligible for enrolment in the programme. Since 3531 Syrian adult patients were ever-enrolled (limited by the cap on cohort size), 23.4% of the target population was reached by this MSF programme (36). Patients were enrolled on a first-come-first-served basis and news of the programme quickly spread by word of mouth.

Retrospective data were analysed from 5045 patients ever enrolled during the study period. The cohort comprised 3664 (72.6%) Syrians, 1365 (27.1%) Jordanians and 16 (0.3%) refugees of other origins (Palestinian or Iraqi), who were middle-aged [mean 54.7 years (SD 15.7)] with multi-morbidity and relatively high rates of self-reported disability (9.9%). The majority (59.8%) were women and 71% (n=3582) had two or more target NCD conditions, with hypertension (60.4%), type 2 diabetes (53.1%), cardiovascular disease (25.9%), hypothyroidism (7.6%) and asthma (7.0%) the most commonly treated conditions (Supplementary material S6). These findings are consistent with the MSF Household Access Survey, which reported a similar prevalence of target NCDs (25). However, the MSF clinic cohort had greater rates of NCD multi-morbidity compared to the adults with NCDs in the household survey (71% vs. 44.7%). NCD risk factor levels were high at enrolment with obesity levels of 62.6%, self-reported smoking rates of 22.7%, and low or zero self-reported regular physical activity in 37.2% (Supplementary material S6).

Qualitative data highlighted that the MSF team felt the quality of mental health services available from another international NGO in Irbid was inadequate and so MSF developed its own MHPSS service from 2016. This initially involved individual counselling and was later expanded, as detailed below. However, interviewed staff perceived that much mental ill health was going undetected at the time of the study. This seemed largely due to a resistance from both medical staff and patients to MPHSS referral, as they

feared it labelled people negatively as having “mental problems”. Thus, by the end of the reporting period, only 0.5% (n=24) of enrolled patients had received a formal diagnosis of a comorbid mental health condition, while only 3.0% (n=154) attended individual counselling sessions. Sixty-six group-counselling sessions were held in 2016, when recording began. MHPSS service data did not capture numbers enrolled in group or waiting room sessions and were not linked to the general dataset.

Access, acceptance and adoption

Under this domain, we described the programme’s components, structures and staffing and we explored patient, provider and stakeholder perspectives on programme accessibility.

Accessibility: We considered access in terms of availability, cost and physical accessibility. MSF services were available to 23.4 % of their targeted Syrian population. MSF took a “cohort approach” to their service provision and both MSF and Jordanian policy required services to also be delivered to the host population. MSF’s policy of providing free care facilitated access to medical consultation, consistent medication supply and laboratory testing for the enrolled Syrians and vulnerable Jordanians. Syrian interviewees, in particular, reported carefully balancing stretched household finances, and choosing to spend on aspects of the service they valued. They prioritised expenditure on transport costs for MSF’s medical consultations over those for MHPSS, health education or laboratory visits. Some purchased their preferred medications from other sources if not provided by MSF.

Interviewed patients and staff perceived that most patients considered the MSF clinics accessible, in terms of distance, transport and convenience. A home visit service was introduced in 2015 to improve access for housebound and frail patients. The team included a nurse, doctor and driver.

The patients generally appreciated the appointment system (which minimised the long waits and prevented the perceived favouritism they experienced in the MOH system) and the SMS (short message service) reminders. However, most saw the system as rigid and inaccessible outside of prescribed appointment times. Staff strongly encouraged patients to attend at their planned appointment day and time, achieving a 90% adherence rate by 2017.

Qualitative data confirmed that Syrian community members had limited access to alternative, affordable primary level NCD services in north Jordan.

“...access to good quality care... that is reliable and regular and predictable... I think that is a big challenge. Affordability is another challenge...” MSF management staff member.

The MSF Household Access Survey corroborates our qualitative finding that cost was the main barrier to obtaining NCD care from other providers. Around a quarter of surveyed adult refugees with self-reported NCDs did not seek care when they felt it was needed. Only 10% reported poor availability as the reason, while the majority (60%) cited cost. Among those who received care, around half made a co-payment (25). Interviewed MSF patients described their difficulty in obtaining a regular supply of affordable NCD medications before enrolling with MSF:

“It’s difficult to buy the medicine always because I can’t afford it. Thank god when I registered at (the MSF clinic) ... I started to have it free. Before I used to take from other places by small amounts of money (or) from the community pharmacy I paid it all.” Syrian FGD participant.

Other international NGOs also provided NCD care to registered and unregistered refugees in Irbid governorate with some requiring co-payments. Registered refugees’ access to MOH primary care clinics was initially free-of-charge but increasing co-payments were introduced from 2014. Most interviewed patients described such co-payments and travel costs as unaffordable. Despite the other available options, staff reported they had a long waiting list of people wishing to access the MSF service.

When asked how NCD patients in their community who were not enrolled in the MSF programme coped, interviewees reported that they skipped medications, shared with family or neighbours or purchased from private pharmacies:

Syrian patient: “If there is a family that can’t bring medicine, we collect pills from here and here, so people help each other ... because there is extra. So people give to each other. I know a kid who takes insulin...I give to people. I’m forced to help people.”

Staff perceived that most Jordanian patients did not, in fact, meet vulnerability inclusion criteria and could, therefore, access alternative free-of-cost services via national or military insurance. This was the case for all interviewed Jordanian patients.

We focussed particularly on the theme of access to specialist referral services. In the middle-income setting of Jordan, secondary and tertiary care services were widely available within the public and private sector, including essential NCD referral services such as ophthalmology, endocrinology, cardiology, nephrology and emergency services. However, as described by our interviewees, accessing specialist services for NCD complications or other conditions via the humanitarian system referral pathway was complex, inconsistent and burdensome for patients, while accessing them directly was costly. In addition to funding primary level MOH access, UNHCR funded registered and unregistered refugees’ access to limited public and private specialist services via their implementing partner Jordan Health Aid Society (JHAS). JHAS played a gatekeeper role and interviewees from MSF and other NGOs perceived their decision-making process as “unhelpful” and lacking clear criteria:

“We don’t really have any ... clear structure dealing with (specialised secondary referrals). The identified system through JHAS and UNHCR, as the funding partner, is complex and lacks clarity and doesn’t always suit our patients.” MSF clinical staff member.

MSF clinical staff could also refer patients to services provided by other NGOs. They reported feeling frustrated and disempowered by the lack of clarity and consistency regarding these referral pathways, the lack of clinical information returned to them by most referral services and their inability to refer directly to MOH specialist care. To address this, MSF had successfully brokered specific agreements with other NGOs to meet particular referral needs e.g. retinopathy screening and angiography. The latter were performed free-of-cost to patients as part of a defined short-term project. The solution to referral gaps, according to interviewed MSF staff, MOH and other stakeholders, was to encourage other international actors to fund and implement these services.

Acceptance and adoption/participation:

Under this domain, we described the programme location, cadres of staff and qualifications. During interviews we explored patients’, staff’s and stakeholders’ acceptance of the programme. With patients, we explored their sources information and support; their experiences of receiving NCD care and how programme participation influenced their well-being. For staff, we examined similar themes as well their experience of using the MSF clinical guideline.

The programme was highly acceptable to patients, staff and stakeholders alike. Interviewed patients felt they received good quality care in a caring and respectful environment. They trusted the service and most continued attending. Cohort data confirmed that most patients were still attending follow-up appointments six months after cohort entry (85%; n=4289). Patients reported that they valued the free medications, regular laboratory and vital sign testing most highly but were also positive about the healthy living advice and “encouragement” given by staff. According to one female patient:

“(MSF is) honestly caring about the patient, caring about his appointments even the medication availability. We have never come here and told us that the medication is not available. Their performance is great.”

Interviewed patients reported being largely unaware of the MHPSS or HLO components of the service, while the medical team were initially distrusting of the MHPSS service and were reluctant to refer (see our related paper) (29). However, staff reported that the “Living Well” groups for specific patients, such as diabetic teenagers and their parents, were very well received by participants and staff.

In contrast to the positive view of MSF services, MOH services were less acceptable for a variety of reasons. These included: cost, long waiting times, rushed consultations with limited physical examination, no psychosocial or healthy living support, inconsistent medication supplies, limited access to laboratory investigations, staff with poor manners and preferential treatment of some attendees.

MSF national and international staff generally prided in their work for MSF:

"...Syrians, we save their lives, ... for me this service is like life... this disease is very difficult and chronic ... and treatment costs a lot," Clinic staff member.

Clinical staff were mainly Jordanian medical and paramedical university graduates, many with previous NGO experience. They were committed to the MSF team and their patients and derived satisfaction from observing patients' improvements.

"I learned here how to see others problems... the disaster they are coming from...how we work here like a team or a family for the benefit of the patients; how you can give to the people...without taking, with nothing in return." Clinical staff member.

There was low turnover among clinical cadres other than non-specialist doctors, who tended to resign after gaining several months' experience with MSF to pursue specialist training. This turnover was considered problematic by clinical supervisors, other staff and patients, all of whom valued continuity of care. A minority of staff expressed dissatisfaction with the perceived lack of promotion opportunities or job security (given the limited duration of MSF programmes), high workload and six-day working week. Interviewed stakeholders valued the programme since it relieved a significant burden on the MOH. Several called for it to be expanded in terms of coverage and scope (for example, by financing specialist referral care).

All interviewed medical staff described the MSF NCD guideline as largely acceptable and "useful". It covered most clinical scenarios they encountered. They appreciated that it could be flexible, adapted to the local context and could be used as a means to negotiate patient demands. However, staff reported encountering several challenges in relation to guidelines, principally the limited guidance on complex patients, the perceived promotion of poly-pharmacy and the inadequate programmatic guidance. The guideline discussed each condition in a stand-alone manner, with limited guidance on complex, multi-morbid patients, such as diabetic patients with significant renal impairment. This vertical treatment of each condition seemed to promote the use of multiple drugs and did not address "de-prescribing", whereby medications are tapered or discontinued. Management staff requested additional programmatic guidance, such as how to define and set limits to primary level NCD care ("what components are included...that is not clear"); and predicting the numbers needing referral services for complications. Clinical supervisors, who were generally of non-Jordanian origin, identified that some Jordanian doctors

felt the guideline limited their autonomy and offered “second-class” care since it recommended older, generic medications. All interviewed Jordanian doctors also commented on the limited user-friendliness of the paper-based guideline. They preferred a digital application that could be easily accessed on their smart phones during consultations.

Effectiveness

To evaluate *Effectiveness*, we examined clinical and quality indicators (Table 2) using retrospective analysis of routine clinical and programmatic data and clinical audit. Perceived effectiveness was explored using qualitative data.

Clinical indicators: Among 4044 adult patients meeting our inclusion criteria (i.e. diagnosed with hypertension and/or Type II diabetes (DMII) and enrolled during the study period), 2912 (72.0%) had hypertension and 2546 (63.0%) had DM II, while 1530 (37.8%) had a dual diagnosis. From the programme perspective, mean per visit SBP decreased among patients with hypertension by 14 mmHg during the study period [143.9 mmHg (95%CI: 140.9-146.9) in December 2014 to 129.9 mmHg (95%CI: 128.9-130.8) in December 2017]. Among patients with DM II, mean FBG decreased by 26.9 mg/dL after 12 months. [from 193.7 (95%CI: 180.8 to 206.7) to 166.8 mg/dL (95%CI: 160.2-173.3)]. Mean HbA1c control improved from 8.9% (95%CI: 8.0 to 9.7) in month one to a mean consistently below the target of 8% (95%CI: 7.0-7.7). From the patient perspective, the proportion of hypertensive patient visits achieving SBP control improved from a baseline of 59% (95%CI: 57%-60%) to 73% (95%CI: 70%-75%) by month six. Among patients with DM II, mean FBG improved from 187.5 (95%CI: 183.6-191.3) at enrolment/new diagnosis to 161.6 mg/dL (95%CI: 156.2-166.9) by six months. These results and those related to treatment interruption are elaborated on in our companion paper (30).

Quality indicators: Additional clinical outcome and process indicators are presented in Table 2. At each health education session patients were asked to categorise their exercise level as active, inactive, moderately active, and moderately inactive but exercise was not otherwise quantified. Activity levels did not seem to improve significantly. We could not determine whether smoking behaviour had changed since it was not quantified and patients’ self-reported smoking behaviour change was only recorded relative to their previous visit. Some activities were under-performed e.g. statin prescribing, CVD risk scoring and performance of annual urinary protein testing in diabetic patients.

Perceived effectiveness: Interviewed staff and patients perceived the programme as effective. Patients reported feeling physically better after attending the programme.

Jordanian patient: *"I feel relieved and comfortable since the first day I came here, I felt the difference in my disease. I used to take pills for diabetes and hypertension but nothing changed."*

Their physical wellbeing was linked to having a regular supply of medications but also to a relief of their psychological stress, due to reduced financial burden and worries around obtaining their medications.

Staff observed greater physical improvements and commitment to behaviour change among Jordanians versus Syrian patients. They linked this to Syrian patients having more limited finances affecting their food choices, fewer options for exercise and increased stress and insecurity.

Table 2. Effectiveness Indicator Results

a. Clinical Outcome Indicators	Result or Comment
% \geq 0.5 mmol/L reduction in total cholesterol from enrolment to last visit (those enrolled \geq 90 days)	Among those with a cholesterol test who were in the cohort for at least 90 days (2585), 651 had \geq reduction of 0.5 mmol/L in total cholesterol = 25.1%
% patients with asthma free from exacerbations/admissions in previous 6 months	Among 382 patients with asthma, 25 recorded exacerbations in total during the study period.
% patients who report decreased/quitting smoking	Not available as self-reported smoking category (stopped, decreased, increased, resumed, unchanged) was reported relative to the last appointment.
% patients who report increased levels of exercise from baseline	At each visit the category (active, inactive, moderately active, and moderately inactive) for recent activity behaviour was recorded. 3347 patients enrolled in the project at least 90 days had a first and last measurement. 610 (18.2%) had improved activity. 593 (17.7%) had worse activity. 2144 (64.1%) stayed the same. There was no significant improvement (chi sq =0.284, p=0.594).
Trend in referrals to another facility for acute complications/specialist care (% of active cohort)	Trend in referral by type of referral service and volume of referrals were analysed
b. Process Indicators	
% recommended referrals to other services that are appropriate as per guideline	Not tested
% of active patients with CVD* prescribed a statin	N = 369 (25.8%)
% of patients with CVD* prescribed aspirin	N = 717 (50.1%)
% of patients with CVD* prescribed at least one anti-hypertensive [^] drug	N = 1007 (70.4%)
% of patients with asthma [#] with inhaler technique check documented	N=48 (94%)
No./% of times when appropriate clinical action taken based on clinical or laboratory findings	Among 130 randomly audited diabetic patient files, 100% had cholesterol checked; 73.8% (n=82) had a CVD risk score subsequently calculated. Of these, 65.9% had a statin correctly prescribed (or not prescribed) according to MSF guidelines ^{&} .
Description of cohort deaths	2.6% (n=139) of enrolled patients died by end of study period. Deaths were determined by word of mouth and a defaulter survey. Among all exited [∞] patients deaths accounted for 9.3% (139 of 1489 exits).

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Legend: * 1431 patients with new or established CVD were ever enrolled during the study period

^ Including: amlodipine, atenolol, bisoprolol, enalapril, hydrochlorothiazide, valsartan; excluding: exclusively frusemide or spironolactone

#Among 51 asthma patients randomly selected for clinical audit

& Technically, the MSF guideline did not require cholesterol testing to be performed before calculating a CVD risk score, but qualitative data confirmed most clinicians waited for cholesterol results before calculating it.

∞ Exited patients refers to those that were known to have died, were lost to follow up despite efforts to trace them or who had informed the team that they would no longer be attending the MSF service.

Implementation

Under this domain, we examined the fidelity of programme delivery, the challenges and facilitators to implementation, the subsequent adaptations made and the costs of programme delivery.

Fidelity of programme delivery: Indicators exploring fidelity of programme implementation are presented in Table 3 and were determined via routine cohort data analysis and clinical audit.

Table 3. Implementation Indicator Results

Indicator	Result or comment
% HTN patients with annual FBG performed	Not available (not calculated)
% DM patients* with annual eye check performed	Annual^ fundoscopy documented OR referred for retinal screening = 50.8%
% of DM patients* with micro-albuminuria or urinary protein tested	Annual^ Albumin creatinine ratio checked in 83.8%
% of DM patients* on ACE inhibitor with creatinine checked	Annual^ creatinine check in 98.5%
% of active cohort with health education session at last clinical visit	66.9%&
Number of MHPSS group sessions monthly	Average 5.5 per month in 2016 and 2017
% of referred patients attending MHPSS individual counselling	Not available as number of internal MHPSS referrals was not captured
Number/% of follow-up consultations performed by nurses	6% in 2017

Legend: *Among 130 randomly selected diabetic patients' charts analysed for the clinical audit

^ Annual referred to the 12 months preceding their most recent appointment

&Among patients active in 2017 (n= 4011)

Key: ACE=angiotensin-converting enzyme; FBG=fasting blood glucose; HTN=hypertension; MHPSS=mental health and psychosocial support;

Challenges and Facilitators: Our qualitative data highlighted that the impact of war and the refugee experience was the key challenge to implementing and maintaining effective NCD care for the Syrian refugee population. Syrian patients' social suffering had profound implications for their ability to engage with the programme in terms of medication adherence, dietary and lifestyle advice, and affordability of access. This theme was explored in detail in our linked paper (29):

"The hypertension goes high not all the time but when I get sad and remember my sons in Syria and they tell me what happens with them I keep crying and crying then my hypertension goes high or goes down. I don't know. Then I take a hypertension pill to settle down whenever I read some news about them," Syrian patient.

Staff reported that patients who attended group MHPSS sessions had a positive experience and felt that more of these groups should be undertaken. However, apart from social acceptability, space, patient transport costs and limited patient engagement were barriers to their implementation. Clinical supervisors described the style used by staff delivering individual health education as “*didactic*”, “*harsh*” and “*combative*”. Staff also used a knowledge-based approach with patients, which involved “*telling them what to do*”. A “solution-focused” approach and motivational interviewing techniques were preferred:

“(Using) words like ‘you are not being honest’, ‘I don’t feel like you’re telling the truth,’ if you only would’ ... doesn’t work... This concept of patient-centred care, solution focused therapy, it’s what works,” Clinical supervisor.

The MSF clinical team described additional contextual challenges around healthy living education and behaviour change. These included diet and exercise norms (high fat, high salt diet and low habituation to exercise for health or leisure), the acceptance of smoking (especially in men), the obesogenic environment and most patients’ reliance on medications to provide solutions.

Staff also reported that low education levels presented challenges around medication education and adherence support. They felt ill equipped to deal with Syrian patients’ war-related trauma and found it personally challenging. However, staff perceived that excellent patient-staff rapport, positive experiences of supervision, support and training, and good teamwork with colleagues assisted them with programme implementation.

Adaptations: Interviewed management and clinical staff described how the programme adapted dynamically to the patient and programmatic challenges that they identified. Adaptations involved modifying the original programme design, based on a high-income country primary care model, to a humanitarian setting. The MHPSS service was an essential addition to the programme. It started with individual counselling sessions and was expanded and reoriented to provide ad hoc psycho-education sessions in waiting rooms, peer-support groups and a targeted group ‘living well’ programme combining health education and psychosocial support. In response to the initial distrust and low rate of referrals from the programme doctors, the MHPSS undertook multidisciplinary staff training sessions, referral rights were extended to nurses and depression screening was introduced. The latter was later paused as the numbers identified by screening overwhelmed existing service capacity. At the time of the study, the team reported a lack of good quality referral options for patients requiring prescription of psychotropic medications or psychiatric input. Therefore, management staff planned to train one family medicine specialist and to expand MSF’s medication list to address this need. The HLO social work role was introduced to address Syrians’ social and protection needs. It was reportedly underutilised as few referrals were made by the clinical team.

Interviewed staff reported learning to adapt health education messages to patients’ literacy and education levels, their limited financial means and their living environments. Staff also involved family

members as informal treatment supporters. As mentioned, the team introduced the home visit service to better serve elderly, frail or housebound patients and this was later expanded. Management staff reported introducing clearer admission criteria relating to patient vulnerability. To increase efficiency, they formalised an appointment system with SMS appointment reminders and created an appointment tool. The care of “stable”, less complex patients was task-shared to nurses and their appointment interval was increased to three months, while family medicine specialists were added to the team to support management of more complex patients. Proposed task shifting of stable patients’ medical reviews to nurses had occurred in a very limited manner by the end of 2017 because of lack of clarity on clinical activity and patient flow, lack of clear eligibility criteria, reported resistance from patients and medical staff, national regulations limiting nurses’ roles. Medication supply and dispensing had also proven a “bottleneck” and the pharmacy team was expanded as a result.

Costs: The total annual financial cost of the NCD programme from the provider perspective increased annually in parallel with greater patient volume, greater service complexity and with the addition of specialist staff. It increased by 52% from INT\$ 4,206,481 in 2015 to INT\$ 6,400,611 in 2016 and by a further 5% to INT\$ 6,739,438 in 2017. Per patient per year cost increased 23% from INT\$ 1,424 (2015) to 1,751 (2016), and by 9% to 1,904 (2017), while cost per consultation increased from INT\$ 209 to 253 (2015-2017). The major cost drivers were human resources (accounting for 38.9%-42.6% of total annual costs) and medications (34.8-43.2%). The costs are reported in detail in a related paper (28).

Maintenance

Under the *Maintenance* domain, we explored the challenges and facilitators related to programme maintenance at the individual and organisational level.

Individual level: At the individual patient level, we explored retention in care, medication burden, challenges and supports around psychosocial issues and adherence to medication and healthy living advice. Routine cohort data analysis showed that the majority of patients enrolled during the study period (N= 5045) were retained in care for over six months, that is, 85.2% attended a follow-up appointment six-months (+/- 30 days) after enrolment; one third of enrolled patients had exited (including 12.5% cumulative loss to follow up and 2.6% deaths) (Table 3).

Over half of adherence survey participants (N=300; 74.4%) were prescribed four or more MSF-provided medications (Supplementary material S4B). The majority (60.4%) also took medications obtained from another source. Most patients (89%) had very high self-reported medication adherence scores. While the majority of individual interview participants (especially Syrians) declared themselves “very committed” to taking medications, several described stopping, taking intermittently or sharing medications with those in

need. Staff and patients both emphasised the negative impact of mental distress on adherence to medications and healthy living advice:

“As I was hearing the stories I thought...this man’s problem is not that he’s smoking too much. His problem is that he ... experienced sexual violence, physical violence in prison in Syria... these two are linked.” Clinical staff member.

Qualitative data confirmed that patients’ medication adherence and behaviour change was facilitated by support from family and MSF staff.

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Organisational level: Here we explored costs of programme maintenance, challenges and modifications made in terms of the broader organisational, contextual and policy environment. We explored potential cost savings that could be gained from reorganisation of medical consultation workflow in our related paper. The frequency of contact with the facility had the greatest influence on cost-savings. As more patients were categorised as “stable”, more were suitable for nurse review and for longer review intervals (28).

Multiple interviewees emphasised the difficulties the programme encountered around the lack of adequate referral pathways:

“The credibility of any service...depends on its ability to refer upwards...That is just as true for people with angina ... (as it is) for mental health,” Management staff member.

As discussed earlier, MSF management staff reported making significant efforts to establish accessible and affordable referral pathways through negotiation and advocacy with UNHCR and other NGO actors.

Challenges also related to the Jordanian regulatory and policy environment, including: the requirement that medications must be locally purchased; the lack of focal point or set of regulations governing NGOs; significant bureaucratic delays; and tight regulation (e.g. around psychotropic medications and nurse-prescribing). Care delivery was also complicated by the culture of private medical care and patients’ care seeking behaviour, with both nationalities tending to visit multiple concurrent providers and to prefer branded medication. However, the availability of highly qualified Jordanian professional staff facilitated implementation of a complex, multidisciplinary programme.

Qualitative data highlighted the importance placed by MSF staff on providing a good quality service that fulfilled MSF’s humanitarian remit. There was a perceived tension between their desire to continually

improve the programme and the need to consider long-term planning and a potential future handover. While the MOH was considered by some management staff as the likely handover partner, they emphasised its limited capacity and the gulf between current MSF and MOH models of NCD care.

Management staff also discussed the internal debate within MSF around the appropriateness of a humanitarian NGO engaging in chronic NCD care and their relative inexperience in doing so:

“An NCD Programme is a relatively recent departure for MSF and it is getting very close to the dividing line between humanitarian and development aid. (There is a) general sense among the humanitarian community that NCDs are an epidemic and need to be dealt with, but I am not sure we have ...(a clear) view of how this should be managed...” Management staff member.

Several MSF management staff on the ground noted that MSF’s more familiar approach, characterised as providing relatively short-term solutions to health care gaps in populations in crisis, was inadequate in the setting of chronic disease care. Several also questioned the sustainability and/or the potential to hand over the complex Irbid care model. Senior MSF staff highlighted the rationale for maintaining the specific vertical programme in Irbid. It served as an opportunity for MSF to “learn by doing” and to understand the essential components of NCD care. Several staff members suggested that MSF could engage more closely with pre-existing health systems in designing future NCD interventions, and could build on their HIV service model, by maximising task sharing and decentralisation of care to community level. They acknowledged that operating in the context of a middle-income country with established systems, regulations and policies required a different type of engagement and negotiation with authorities compared to other contexts where MSF has traditionally worked.

Discussion

Our mixed methods evaluation guided by the RE-AIM framework has helped to characterise the implementation strategies, challenges and adaptations made to a complex intervention providing primary level NCD care in a humanitarian setting. The MSF Irbid NCD Programme was a complex, multidisciplinary programme that was acceptable to patients, staff and stakeholders. It delivered good intermediate clinical outcomes but to a limited number of patients and at relatively high cost. The programme served MSF well as a learning ground but was unlikely to be scalable or reproducible in its current form. Lessons learned have helped improve the current programme, now in its sixth year, and may serve to inform the design of NCD services in Jordan or in humanitarian settings more broadly.

Delivering chronic care in a humanitarian setting

The MSF team encountered numerous challenges in delivering NCD care in a humanitarian setting. Syrian patients had experienced the trauma of war and great personal loss, which had profound

implications for their ability to engage with the programme. They were also trying to manage their chronic disease in a refugee setting with all the attendant psychosocial, physical and financial challenges. This proved the key challenge to implementing and maintaining effective NCD care in the Syrian refugee population (29). Our finding that the programme was being delivered within the framework of a complex and fragmented humanitarian system is consistent with reports from other authors (24,27). Staff struggled to assist patients in navigating an often opaque, frustrating and unresponsive referral system. In addition, the programme also operated in a middle-income country of the Middle East with well-established health systems, regulations and policies, which tightly regulated humanitarian actors' activities.

This MSF team repeatedly adapted the programme to patient and programmatic needs. We learned it was vital to ensure that specific, culturally-relevant MPHSS services were included as an integral part of the NCD care package (29). Other key adaptations included the introduction of the HLO social work role and the development of specific referral criteria for MHPSS, social work and external services. There appeared to be scope to further improve the delivery of patient education by taking a more solution-focused approach, thereby utilising patients' own strengths, skills and intrinsic motivation (37).

The lack of accessible, affordable and consistent specialist care referral pathways for NCD complications in this context has been described in the literature (24,38). The increasing demand and dwindling international funding for humanitarian crises means that this is unlikely to improve in the near future. Since MSF was precluded from directly referring to MOH secondary/tertiary care, they had successfully negotiated referral pathways with other NGOs. However, these were transient and largely depended on short-term project-based funding. For future NCD programme design, we recommend attempting to secure essential referral pathways (e.g. ophthalmology, cardiology, nephrology) that are acceptable, accessible and affordable for patients. We suggest that pathways should link directly with MOH services, where possible. This would require agreement on financing, clear referral criteria and continuity of information. We acknowledge, however, that this may be hugely challenging, especially in low-income countries with constrained health systems.

MSF also adapted the typical humanitarian approach to the needs of chronic care, by introducing specific appointment times, appointment reminders, individual patient files and a patient-level electronic database. The latter allowed for cohort analysis, as previously demonstrated by the UN Relief and Works Agency for Palestinian refugees (UNRWA) (39–41). Key lessons were the need for a fit-for-purpose and actionable information system and the need to establish informative indicators without overburdening staff with data collection.

Effectiveness of the programme

NCD risk factors and prevalence among enrolled patients reflected those among broader regional and Syrian refugee populations in Jordan (25,26,42,43). The programme appeared to achieve good intermediate clinical outcomes, which improved with length of stay in the programme and as the programme matured. These findings are similar to those reported by MSF and UNRWA in similar humanitarian settings (30,39,44). However, it should be noted that we know little about the prevalence or outcomes of major complications, such as heart failure, ischaemic heart disease and peripheral vascular disease. This is partly because they are difficult to measure at primary care level, requiring equipment and trained personnel, but also because of the limited affordable specialist care available to MSF patients for diagnosis of these conditions in Jordan (24,45).

While the staff reported that the MSF guideline was useful and usable, clinical audit data showed that some areas were not well implemented, for example statin prescribing. Since this is a proven, effective strategy to reduce mortality, we suggest that further staff training on CVD secondary prevention, further audits, ideally as part of a quality improvement strategy, and the introduction of fixed dose combination CVD secondary prevention drugs may boost statin prescribing (45–47).

Patient adherence to medication is also essential to effectiveness. Patients' self-reported adherence was high, yet in interviews they described non-adherent behaviours, sharing medications and attending multiple providers. Further work needs to be done to determine how best to measure and to support adherence in this population. As in other settings, adopting the model of concordance, individualising a multi-faceted treatment support approach, joint decision making with patients and formally involving treatment supporters may prove valuable (48).

Maintaining the programme

We identified a number of key challenges to maintaining the programme and areas for further improvement. Principal among these was cost. MSF management staff perceived the programme to be costly but, to our knowledge, there are no available published data to directly compare the programme's costs with similar services, either in the Middle East region or in other humanitarian settings. MSF have reported *incremental* PPPY costs when adding ambulant diabetes care to existing hospital services in Mweso, Democratic Republic of Congo [INT\$222 (2015)] and when integrating NCD care with HIV and general outpatient services in Eswatini [INT\$441 (2016)] (7,31). Limited data on NCD care from countries affected by the Syrian crisis have focussed on the costs of secondary or tertiary level care (49–51). For

cost and operational reasons, MSF limited the service's reach by capping the cohort size, and limited its scope by treating a defined number of chronic conditions at primary care level only. While patients highly valued the care they received, they were frustrated by this siloed approach. Interviewed MOH stakeholders would also have liked the service expanded but this was unlikely to receive support from MSF operations at the time of this study.

In our related paper, we explored avenues to improve cost efficiency around the two main drivers of costs: medications and human resources (28). The first involved adapting procurement approaches to the local context. The second related to the ability to triage the cohort patients by disease complexity and control, introducing task-sharing and spacing review appointments for stable patients. The clinical review interval could potentially be further reduced to 6-monthly if medication-dispensing systems could support this (52). It was possible to employ family medicine specialists to manage the more complex patients in Irbid because of the availability of highly qualified Jordanian staff, unlike in many humanitarian settings with more constrained health systems. It is therefore essential to provide additional programmatic and clinical guidance around poly-pharmacy (and de-prescribing), multi-morbidity, frailty and palliation in the MSF guideline. Written guidance could potentially be supported by technology, such as telemedicine and/or mHealth decision support tools, as trialled in Lebanon (53).

MSF staff reported that Jordanian bureaucracy and tight regulation were barriers to maintaining the programme. Recently, this has improved as the Jordanian government has introduced an online system for humanitarian agencies to access governmental departments (28). Humanitarian actors' modus operandi is to rapidly bring healthcare to vulnerable or marginalised populations then withdraw or hand over activities as the context dictates. This approach is not consistent with the continuous care required for chronic conditions and may explain interviewed participants' apparent discomfort with the lack of a "handover strategy". Senior staff emphasised the role the Irbid programme played as one of MSF's pilot NCD-specific programmes. It served both to anchor the organisation in Jordan and as a training programme. However, MSF and other humanitarian actors recognise that integration of NCD care within existing health systems, ideally at primary care level, may be the optimal approach (2). Integration may provide an opportunity for health system strengthening, particularly in contexts where resource-poor health systems have previously focussed on episodic emergency or infectious disease care and have limited capacity to provide chronic disease care (1,54,55). Designing future NCD services may require a comprehensive analysis of the pre-existing health system's readiness to manage NCDs, particularly at primary care level, and its resilience in the face of crisis.

Programme Reach and Access to chronic care in Jordan

One of the key themes that emerged was lack of access to affordable NCD care for those not enrolled in the MSF programme and for MSF patients to access care for other conditions, consistent with the literature (24–27). Affordability and accessibility were likely to have been further impacted by the 2018 change in Jordanian government policy to significantly increase MOH co-payments for Syrian refugees to “foreigner” levels, which was later reversed in 2019 (27). McNatt et al. reported that NCD patients sought care from the NGO sector rather than MOH services following this 2018 policy change. They attended multiple providers in an attempt to create comprehensive NCD care for themselves but found this process “burdensome, not only financially but physically and emotionally”. MSF could also note that their finding that the burden of indirect costs of clinic attendance (transport, lost work time) potentially outweighed the benefits of free NGO-provided care (27).

Lessons learned and potential solutions

The lessons learned and adaptations made as the programme evolved may be relevant to MSF, the MOH and other humanitarian actors and may be transferable to other settings. A number of approaches are interlinked and could potentially achieve several things: increased patient-centeredness, increased cost-efficiency for patients and provider, and increased coverage. These goals could be achieved by reducing facility-based contact through decentralisation, enhancing community-level care and supporting patient self-management. These approaches could involve task-sharing to nurses or other non-physician health worker cadres, such as community workers or volunteers. Several aspects of the care pathway could be shifted to the community level, including prevention and sensitisation activities, diagnosis, treatment monitoring and adherence support. Patient centeredness (taking a holistic, responsive approach and actively collaborating with patients and families) could involve either providing “one stop shop” comprehensive primary care at a single facility visit or bringing care to the patient via outreach workers or home care teams (32)(56,57). Adherence and self-management could be supported via mobile phone or wearable technology or through peer support groups led by community workers or peers (55). Clearly, the specific design and the successful implementation of these strategies would be context-dependent and would rely on local acceptance by patients, staff and the medical fraternity as well as political and regulatory support.

Several actors in Jordan have introduced community-based healthy living interventions or peer support groups for people with diabetes on project or pilot bases (58–61). Some reported positively impacting intermediate clinical outcomes, such as weight and blood glucose levels. However, cost effectiveness, sustainability, acceptability or user experiences were not formally examined. The recently published HOPE4 trial also demonstrated the benefits of a community-based package of care for hypertension in a non-humanitarian setting (62).

Strengths and limitationsExperience of using RE-AIM: To the best of our knowledge this is the first study to comprehensively describe a mixed-methods evaluation of an NCD service in a humanitarian setting guided by the RE-AIM framework. It builds on our previous use of the framework in the Democratic Republic of Congo (6,7). We made comprehensive use of RE-AIM, addressing each of the domains and including more extensive qualitative and costing analyses than are usually employed in the RE-AIM literature (14). Our rich explanatory qualitative data supplemented quantitative and costing data to provide greater insight into what worked, for whom and why. While most REAIM domains were comprehensively described, we could comment in only a limited way on *participation* as it has been traditionally used, since this intervention took place at a single site rather than involving multiple sites/providers.

There is a lack of evidence describing the effectiveness of NCD care models in humanitarian settings and a need to improve evaluation of humanitarian programmes in general (3,8–11,63). We demonstrated that implementation research can be carried while placing limited burden on staff and patients. We also highlighted the challenges in retrospectively evaluating humanitarian programmes, which tend to be highly responsive to changing contexts, and in analysing routinely collected data. For example, it was not feasible for us to include a comparator group or use a quasi-experimental design, such as interrupted time series, given the dynamic and unique nature of the programme. Indicators designed for this evaluation have contributed to the ongoing development by humanitarian organisations of a set of shared NCD indicators. However, a number of our indicators could not be measured due to failure to collect or limited usability of data. We emphasise the need to co-develop indicators with implementers when designing an evaluation, especially when using routine programmatic data. We note that social desirability bias may have influenced results of the qualitative data and of the self-report medication adherence survey, which was mainly administered by the data collectors rather than by patients as intended. A key limitation is our limited understanding of the situation of people with NCDs who could not or did not reach care, for instance, those who were undiagnosed, who attended irregularly, or who could not access services.

Future research and evaluation

We recommend that future research should focus on elucidating programme impact, where possible, using methods such as causal inference frameworks and prospective interrupted time series analyses. They should use longer study durations to examine hard outcomes, such as cardiac events and deaths. Further exploration of quality, utilising patient quality of life and satisfaction outcomes, would also be useful, as would patient-level costing studies, examining direct and indirect patient costs. As discussed, there is a need to design and evaluate streamlined high-quality NCD programme models in humanitarian settings, particularly facilitating access for mobile or dispersed population. These may include elements such as task sharing; use of fixed-dose combination drugs; decentralisation to the community and

reduced frequency of facility contact e.g. through use of wearable technology and home or community-based disease monitoring. Designing and evaluating novel ways to improve access to diagnosis and management of NCD complications at primary care level is also essential, which could include use of telemedicine, mobile technology or artificial intelligence-supported diagnosis or clinical decision tools (45,53,63).

Conclusion

RE-AIM has proven a valuable tool to guide the evaluation of a complex intervention in a protracted humanitarian crisis setting. The MSF programme was perceived as highly acceptable to patients, staff and stakeholders. It was accessible and affordable for the programme's cohort of enrolled patients, while achieving good clinical outcomes. However, the programme had limited reach and the current model was both costly and complex and therefore challenging for other actors to emulate or to translate to other, more financially constrained-settings. We propose that simplification of the care model, reduction of costs and use of technology could improve effectiveness and efficiency without reducing acceptability and may improve transferability to other settings.

Key Recommendations:

1. **Patient-centred.** Adopt a contextualised, patient-centred approach where possible. For example, deliver care at community level, support patients and families to self-manage and provide holistic, "one-stop-shop" care at facility visits. Elicit and respond to patient priorities. In this case they were: consistent, affordable medication and a respectful and caring staff.
2. **Complex, yet efficient care.** There is a broad range of patient complexity involved in NCD care, from asymptomatic hypertensive patients to frail, elderly patients with complex disease involving polypharmacy and multi-morbidity. It is important to acknowledge this complexity and the holistic approach needed when drafting guidelines and designing services. Consultations are time consuming and patients may require frequent review. Where appropriate, a context-adapted, algorithm-driven approach may facilitate task sharing to nurses of the stable, less complex patients. Introducing fixed dose combination pills, for example, may reduce pill burden and ease adherence, while simplifying prescribing and workload in relevant settings.

3. **Continuum of care.** NCDs require a continuum of care involving primary prevention, diagnosis and treatment, prevention and management of complications, psychosocial support, rehabilitation and palliation. A multi-disciplinary team would ideally deliver this package of care, where available.

4. **Mental health and psychosocial support** should be included as an integral part of primary level NCD services in humanitarian settings. This may be integrated or provided by partner organisations. Provide a tiered approach to MHPSS according to need: 1. Basic support available to all, 2. Psychosocial or peer support groups for specific patient groups (such as teenagers with diabetes), and 3. Individualised counselling and medical intervention.

5. **Adapted healthy living advice.** Adapt advice to patients' constrained circumstances and use proven techniques such as solution-focussed counselling and motivational interviewing.

6. **Access to referral services.** A predictable proportion of patients will require referral for screening, diagnosis or treatment of NCD-related complications. However, it may be difficult to secure essential referral pathways (e.g. ophthalmology, cardiology, nephrology) that are acceptable, accessible and affordable for patients. Therefore, it is essential to maximise the quality of primary NCD care to prevent, identify and effectively manage complications.

7. **Low cost to patients yet cost-efficient for providers.** The ideal way to ensure access is to provide free-of-charge care to patients, where possible. The model of NCD care presented here was relatively costly, especially in terms of HR and drugs, and savings could be made by reducing the frequency of facility-based contact and introducing context-adapted procurement practices.

8. **Health system strengthening.** Integrate with host health systems where possible and engage in health system strengthening appropriate to the local context in order to ensure sustainability and facilitate movement of patients from private to state health systems. This may require a comprehensive analysis of the pre-existing health system readiness to manage NCDs, particularly at primary care level, and its resilience in the face of crisis, before embarking on an NCD intervention.

9. **Monitoring and evaluation adapted to chronic care.** Implement more broadly the structures, reporting mechanisms and indicators developed within the MSF Irbid programme to reflect the needs of a chronic disease programme.

10. Engage patients and stakeholders in the design and evaluation of new models of NCD care in humanitarian settings. These may involve simplification, greater use of task sharing, decentralisation of care to the community level, and use of technology for patient and provider support.

Abbreviations

BP Blood Pressure

BMQ Beliefs About Medicines Questionnaire

COPD Chronic Obstructive Pulmonary Disease

CVD Cardiovascular Disease

DM Diabetes Mellitus

FBS Fasting blood sugar

FGD Focus Group Discussion

HbA1c Glycosylated haemoglobin

HE Health Education

HLO Humanitarian Liaison Officer

HTN Hypertension

INT\$ International Dollars

JHAS Jordan Health Aid Society

LMIC Low- And Middle-Income Countries

MARS-5 Medication Adherence Report Scale-5 item

MENA Middle East and North Africa

MOH Ministry of Health

MSF Médecins sans Frontières

MHPSS Mental Health & Psychosocial Support

NCD Non-Communicable Disease

NGO Non-Governmental Organisation

RE-AIM Reach, Effectiveness, Adoption, Implementation and Maintenance

SMS Short Message Service

SSI Semi-Structured Interview

UNHCR United Nations High Commissioner for Refugees

UNRWA UN Relief and Works Agency for Palestinian Refugees

WHO World Health Organization

Declarations

Ethics approval and consent to participate: The Médecins sans Frontières Ethics Review Board, the London School of Hygiene and Tropical Medicine Ethical Review Committee [Reference 12239] and the Jordanian Ministry of Health granted ethical approval for conduct of this study.

Consent for publication: Informed written consent to participate in the study and for publication was obtained from participants in the qualitative and medicine adherence components of the study. Consent was not sought from patients for use of their de-identified, routinely collected clinical data for the cohort analysis or clinical audit study components.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request, with the permission of Médecins sans Frontières and under a data sharing agreement.

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Authors' contributions: EA, KJ, BR, PP, KB, MT were involved in conception and/or design of the study; EA and JQ collected the data and EA, KJ, BR, PP, JQ were involved in data interpretation; EA drafted the paper

with contribution from KJ, BR, PP. All authors read and approved the final manuscript.

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Tables

Table 1. Main indicators and data method/source based on the RE-AIM domains

Objective / Domain (Questions)	Sub-Domain	Indicator	Methods (a methodology may feature under several headings)
<p>Reach</p> <p>Does the programme reach its target population?</p>	<p>Coverage</p>	<p>Number people among the target population eligible for programme</p> <p>Number served by the programme</p> <p>Representativeness of those reached</p> <p>Prevalence of NCD and MH comorbidity; eligibility for MHPSS services; numbers referred/receiving care; representativeness of those reached</p>	<p>Existing MSF cross-sectional survey [^]</p> <p>Routine cohort data</p> <p>Qualitative data</p>
<p>“Effectiveness”/ Quality of Care</p> <p>What are the trends in clinical outcomes and quality indicators of the programme?</p> <p>What are the perceived benefits/unintended consequences from a patient and provider perspective?</p>	<p>Clinical Outcomes</p>	<p>No./% HTN patients with most recent BP <= 140/90, 6 & 12 months post enrolment and trend from baseline*</p> <p>No./% of DM patients with most recent BP <= 140/90, 6 & 12 months post enrolment and trend from baseline*</p> <p>No./% of patients with diabetes with last HbA1c < 8.0 % 6 & 12 months post enrolment and trend from baseline*</p> <p>No./% with cholesterol reduction >= 0.5 mmol/L from baseline at 6 and 12 months post enrolment</p> <p>No./% of patients with asthma / COPD free from exacerbations/ admissions in previous 6 months</p>	<p>Routine cohort data</p> <p>Qualitative data</p>

	No./% of patients who report decreased/quitting smoking	
	No./% of patients who report increased levels of exercise from baseline	
	Trend in referrals to another facility for acute complications/specialist care	
Quality Indicators	Proportion of referrals to other services that are appropriate per guideline	Clinical audit Routine cohort data
	No./% active [¶] CVD patients prescribed a statin	
	No./% active [¶] CVD patients prescribed aspirin	
	No./% active [¶] CVD patients prescribed at least one anti-hypertensive	
	No./% COPD/ asthma patients with inhaler technique check documented	
	No./% appropriate clinical action taken based on clinical/laboratory findings	
	Trend in defaulters* as a proportion of active cohort during reporting period	
	Description of cohort deaths (patient characteristics)	
Perceived Effectiveness	Patients' and providers' perspectives on effectiveness of programme components (clinical	Qualitative data

		review, medications, HE, HLO, MHPSS, HV)	
Adoption/ acceptance	Accessibility/ acceptability	<p>Duration and frequency of NCD service and components</p> <p>Staff (e.g. ratio of staff per patient)</p> <p>Structures and tools</p> <p>Treatment continuity/rupture</p> <p>Staff and patient perceptions of availability and accessibility / barriers to access of service components (clinical review, HE, HLO, MHPSS, HV)</p> <p>Staff perspectives on acceptability/usability of NCD guideline</p> <p>Key stakeholder views on acceptability/accessibility MSF NCD programme</p> <p>Self-reported medication adherence levels and medication beliefs</p>	<p>Routine cohort data</p> <p>Qualitative data</p> <p>Self-report medication adherence questionnaire</p>
<p>Is the MSF model of NCD care accessible and acceptable to patients, providers, organisation and community?</p> <p>Is the MSF NCD guideline acceptable to staff?</p>			
	Adoption/participation	<p>Description of intervention location, cadres of staff and qualifications; inclusion/exclusion criteria of staff/settings delivering service</p> <p>Sources & perception of information/support</p> <p>Experience of receiving and providing NCD care, use of clinical guideline</p>	<p>Routine cohort data</p> <p>Qualitative data</p>

		How participation influenced patient/staff well-being and/or work practices	
<p>Implementation</p> <p>To what extent was the intervention delivered as intended?</p> <p>What are the facilitators and barriers to implementing the programme from a patient, provider and programmatic perspective?</p> <p>What are the essential components and adaptations necessary to delivering an NCD service in this setting?</p> <p>What are the start-up and incremental costs of delivering such a service?</p>	<p>Fidelity of programme delivery</p> <p>(Process Indicators; indicators in bold also reflect quality of medical care)</p>	<p>Extent to which clinical guideline delivered as intended:</p> <p>No./% of eligible patients with HTN with annual FBS performed during the reporting period</p> <p>No./% of eligible patients with diabetes that have had an annual foot check/ eye check performed during the reporting period</p> <p>No./% of DM patients that have micro-albuminuria or urinary protein testing during the reporting period</p> <p>No./% of DM patients on ACE inhibitor (ACEi) with creatinine testing during the reporting period</p> <p>No./% asthmatics and COPD with control review (spirometry or clinical) during the reporting period</p> <p>No./% of active cohort attending a health education session at last clinical visit within reporting period</p> <p>No. of MHPSS group sessions taking place monthly during reporting period</p> <p>No./% of referred patients attending MHPSS individual counselling sessions</p> <p>No./% of times when clinical action taken</p>	<p>Clinical audit</p> <p>Routine cohort data</p>

		based on clinical or laboratory findings according to guideline	
	Adaptations	NCD care adaptations to the local setting (e.g. cultural adaptations; dietary and exercise, smoking advice) Programme adaptations related to humanitarian setting e.g. response to patients' psychosocial needs	Qualitative data
	Cost	Staff time Capital and recurrent implementation costs #	Qualitative data Medicine/supply/ staff costs# Staff time estimates#
Maintenance	Individual Level	No./% patients active [¶] 6 months post enrolment * No. medications and daily pill count at last consultation Self-reported medication adherence rates and medication beliefs <u>Qualitative measure of individual-level maintenance:</u> · Key challenges in maintaining medical treatment (including medication concordance) · Key challenges in altering lifestyle (diet, exercise, smoking) · Key mental health/ psychosocial challenges	Routine cohort data Clinical Audit Qualitative data Medicine/supply/ staff costs# Staff time estimates Self-report medication adherence questionnaire
What are the challenges and facilitators for patients to remain in the programme?			
What are the costs involved in maintaining the programme?			
What are the programmatic challenges and adaptations made to maintain the programme?			

	<ul style="list-style-type: none"> Types of support available and strengths and challenges of the support (health education, MHPSS, HLO, family and community support)
Organisational Level	<p>Measures of cost of maintenance[#]</p> <p>Institutionalisation of the programme/modifications made for maintenance</p> <p>Alignment with organisational mission</p>

Key: ACEi=angiotensin converting enzyme inhibitor; BP=blood pressure; COPD=chronic obstructive pulmonary disease; CVD=cardiovascular disease; FBS=fasting blood sugar; HLO=humanitarian liaison officer; HV= home visit; MHPSS=mental health and psychosocial support; NCD=non-communicable disease. ^ The methods and results pertaining to these indicators are reported in Rehr et al (29). * The methods and results pertaining to these indicators are reported in our linked paper (28). # The methods and results pertaining to these indicators are reported in our linked paper (26). ¶ Active patients referred to those that have continued to attend the service and have not exited (i.e. died, departed the area or defaulted (i.e. have not attended for more than 90 days since their last planned appointment))

Table 2. Effectiveness Indicator Results

a. Clinical Outcome Indicators	Result or Comment
No./% with \geq reduction of 0.5 mmol/L in total cholesterol from enrolment to last visit, among those in the cohort at least 90 days	Among those with a cholesterol test who were in the cohort for at least 90 days (2585), 651 had \geq reduction of 0.5 mmol/L in total cholesterol = 25.1%
No./% of patients with asthma free from exacerbations/ admissions in the previous 6 months	Among 382 patients with asthma, 25 recorded exacerbations in total during the study period.
No./% of patients who report decreased/quitting smoking within reporting period	Not available as self-reported smoking category (stopped, decreased, increased, resumed, unchanged) is only reported relative to the last appointment.
No./% of patients who report increased levels of exercise from baseline during reporting period	Per visit the category (active, inactive, moderately active, and moderately inactive) for activity behaviour was recorded. 3347 patients enrolled in the project at least 90 days had a first and last measurement. 610 (18.2%) had improved activity. 593 (17.7%) had worse activity. 2144 (64.1%) stayed stable. There was no significant improvement (chi sq =0.284, p=0.594).
Trend in recommended referrals to another facility for acute complications/specialist care, as a proportion of active cohort	Trend in referral by type of referral service and volume of referrals were analysed
b. Process Indicators	
Proportion of recommended referrals to other services that are appropriate as per guideline	Not tested
No./% of active patients with CVD* prescribed a statin during reporting period	N = 369 (25.8%)
No./% of patients with CVD* prescribed aspirin during reporting period	N = 717 (50.1%)
No./% of patients with CVD* prescribed at least one anti-hypertensive [^] during reporting period	N = 1007 (70.4%)
No./% of patients with asthma [#] with inhaler technique check documented	N=48 (94%)
No./% of times when appropriate clinical action taken based on clinical or laboratory findings according to guideline (e.g. was a statin prescribed correctly according to CVD risk score documented in patient file?)	Among 130 randomly audited diabetic patient files, 100% had cholesterol ever checked and 73.8% (n=82) had a CVD risk score subsequently calculated. Of these, 65.9% had a statin correctly prescribed (or not prescribed) in accordance with the MSF guideline ^{&} .
Description of cohort deaths	2.6% (n=136) of enrolled patients died by the end of the study period. Deaths were determined by word of mouth and following a defaulter survey, which showed that deaths among exited [∞]

patients were significantly higher at 9.3% (139 of 1489 exited patients).

* 1431 patients with new or established CVD were ever enrolled during the study period

^ Including: any of amlodipine, atenolol, bisoprolol, enalapril, hydrochlorothiazide, valsartan;
excluding: exclusively frusemide or spironolactone

#Among 51 asthma patients randomly selected for clinical audit

& Technically, the MSF guideline did not require cholesterol testing to be performed before calculating a CVD risk score, but qualitative data confirmed most clinicians waited for cholesterol results before calculating it.

∞ Exited patients refers to those that were known to have died, were lost to follow up despite efforts to trace them or who had informed the team that they would no longer be attending the MSF service.

Table 3. Implementation Indicator Results

Indicator	Result or comment
Number / % of eligible patients with HTN with annual FBS performed during the reporting period	Not available (not calculated)
Number/ % of DM patients* that have had an annual eye check performed during the reporting period	Annual [^] fundoscopy documented OR referred for retinal screening in 50.8%
Number / % of DM patients* that have micro-albuminuria or urinary protein testing during the reporting period	Annual [^] Albumin creatinine ratio checked in 83.8%
Number / % of DM patients* on ACE inhibitor with creatinine testing during the reporting period	Annual [^] creatinine check in 98.5%
Number / % of active cohort attending a health education session at last clinical visit within reporting period	66.9% ^{&}
Number of MHPSS group sessions taking place monthly during reporting period	Average 5.5 per month in 2016 and 2017
Number/ % of referred patients attending MHPSS individual counselling sessions	Not available as numbers of internal MHPSS referrals made was not captured
Number/% of follow-up consultations performed by nurses	6% in 2017

*Among 130 randomly selected diabetic patients' charts analysed for the clinical audit

[^] Annual referred to the 12 months preceding their most recent appointment

&Among patients active in 2017 (n= 4011)

Key: ACE=angiotensin-converting enzyme; FBS=fasting blood glucose; HTN=hypertension;
MHPSS=mental health and psychosocial support;

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryMaterialS3.MSFIrbidNCDProgrammeTimeline.xlsx](#)
- [SupplementaryMaterialS6.docx](#)
- [SupplementaryMaterialS5.docx](#)
- [SupplementaryMaterialS4.docx](#)
- [SupplementaryMaterialS2.docx](#)
- [SupplementaryMaterialS1.docx](#)