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Lessons learned from implementing the Non-Communicable Diseases Kit in a humanitarian emergency: an operational evaluation in Sudan

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ABSTRACT

Non-communicable diseases (NCDs) are a major global health concern, and their management is particularly challenging in humanitarian contexts where healthcare resources are limited. The WHO Non-Communicable Diseases Kit (WHO-NCDK) is a health system intervention targeted at the primary healthcare (PHC) level and designed to provide essential medicines and equipment for NCDs management in emergency settings, meeting the needs of 10 000 people for 3 months. This operational evaluation aimed to assess the effectiveness and utility of the WHO-NCDK in two PHC facilities in Sudan and identify key contextual factors that may influence its implementation and impact. Using a cross-sectional mixed-methods observational approach that combined quantitative and qualitative data, the evaluation found that the kit played a critical role in maintaining continuity of care when other supply chain solutions were disrupted. However, contextual factors such as local communities' unfamiliarity with healthcare facilities, the national integration of NCDs into PHC, and the existence of monitoring and evaluation systems were identified as important considerations for enhancing the WHO-NCDK's utility and usefulness. The evaluation suggests that the WHO-NCDK can be an effective intervention in emergency settings, provided that contextual factors such as local needs, facility capacity and healthcare worker capacity are considered before kit deployments.

SUMMARY BOX

- ⇒ The WHO Non-Communicable Diseases Kit (WHO-NCDK) is a resource to meet initial primary healthcare (PHC) needs for non-communicable diseases (NCDs) in emergency settings.
- ⇒ This operational evaluation aimed to assess the utility, effectiveness and relevance of the WHO-NCDK in PHC settings in Sudan.
- ⇒ The evaluation identified several pre-deployment factors that need to be addressed to ensure effective WHO-NCDK utilisation and provided evidence for key recommendations to improve future deployments.
- ⇒ Prior to shipping these kits, it is crucial to address pre-deployment factors to ensure their utility and relevance. These factors include
  - ⇒ Establishing or strengthening a systematic process to identify local community needs to assign relevant WHO standard emergency health kits.
  - ⇒ Strengthening surveillance systems to support effective WHO-NCDK utilisation and provide insights on the regional burden of NCDs and the quality of care provided.
  - ⇒ Addressing challenges in service delivery such as tailored guidelines to PHC level that align with national guidance, technical skills and awareness of healthcare workers (HCWs) for NCD management, medical record and clinical documentation practices, and strategies to ensure continuity of care for chronic conditions.

INTRODUCTION

Non-communicable diseases (NCDs) are a growing burden globally and have created additional challenges for healthcare systems in low-income and middle-income countries during humanitarian emergencies.[1] The Interagency Emergency Health Kit (IEHK) was designed to provide relief for the health needs of populations in crisis, but has limited portfolio of medicines and equipment for NCD management.[2] To address this gap, the WHO Non-Communicable Diseases Kit (WHO-NCDK) was developed in 2016 for pre-positioning or rapid deployment in humanitarian emergencies, based on the shortcomings of the IEHK.[2] The WHO-NCDK includes a structured set of medications, equipment and renewables to meet the needs of 10 000 people over a period of 3 months following the interruption of normal services. The WHO-NCDK is organised by disease area (cardiovascular, diabetes and endocrine, chronic respiratory

SUMMARY BOX

- ⇒ The operational evaluation had similar findings to previous WHO-NCDK evidence and provided additional support for the following recommendations:
  - ⇒ Reviewing the WHO-NCDK content and modular design to accommodate flexibility in items/quantities based on the level of service delivery and local needs. The kit could also be reframed into further subcategories organised by NCD type.
  - ⇒ Strengthening collaboration and communication between stakeholders to avoid silo working and ensure faster delivery of future kits.
  - ⇒ Enhancing the capacity of HCWs to manage NCDs.
  - ⇒ Define a basic package of NCD interventions and the essential commodities that will be supplied before integrating and deploying NCD services.

diseases, mental health, neurological and other conditions) and made of five submodules that can be ordered separately—(1a) medicines for NCDs and mental health, (1b) cold chain medicines such as insulin, (1c) consumables such as band-aids and urine test strips, and (1d and 1e) equipment renewables such as blood glucose strips and equipment itself such as glucometers.[3] For ease of geographical access, the WHO-NCDK inventory is prepositioned in the WHO medical logistics hub in Dubai, United Arab Emirates. It was initially deployed in emergency countries and territories in WHO Regional Offices in the Eastern Mediterranean (EMRO), Africa region (AFRO) and the South East Asia region (SEARO).[4] The WHO-NCDK has been revised recently and a new version is expected to be released in 2023, incorporating insights gained from previous evidence including the WHO-led assessments in Syria, Iraq and Afghanistan (2018), and the WHO and International Rescue Committee (IRC) detailed assessments in Yemen, Libya and South Sudan (2019–2021).[4 5]

Previous studies have shown emergency health kits to be a vital way to provide essential medicines and supplies during humanitarian emergencies, and the WHO-NCDK has supported the essential delivery of NCD patient care in some complex humanitarian settings.[2 4 6] However, challenges affecting its use include supply chain and delivery issues, types/quantities of kit contents, poor monitoring and evaluation (M&E) systems, and the capacity of staff and facilities to manage NCDs.[4] To address these challenges, an operational evaluation was conducted in Sudan. Sudan was selected as an evaluation site because the country is affected by complex humanitarian situations, has a high burden of NCDs[7–13] and had two facilities where a 2016 version of the WHO-NCDK module 1a was deployed. The purpose of this evaluation was to assess the deployment process, contents, usage and limitations of the WHO-NCDK. Our aim was to identify areas of improvement and assess the kit's effectiveness in addressing the needs of patients with NCDs during humanitarian emergencies. We also explored the kit's acceptability from the perspective of healthcare workers (HCWs). To further improve the quality-of-care (QoC) offered, we used a patient record auditing tool to assess the quality of patient records and gauge the QoC offered.

EVALUATION SETTINGS

The evaluation took place in two primary healthcare (PHC) health facilities supported by the IRC. The first is Al-Yarmouk PHC centre, located in Mayo settlement which is approximately 15 km away from the centre of Khartoum. The settlement has been hosting refugees from South Sudan as well as internally displaced persons from Darfur and South Kordofan states. The settlement is home to 11 200 families and is no longer considered as a camp since most families have been living there for years.[14] The second facility is the IRC PHC centre in Tunaydbah refugee camp which is located in Gedaref state in East Sudan and is host to 20 609 displaced Ethiopian refugees following the recent conflict in Tigray region.[15]

OPERATIONAL EVALUATION METHODOLOGY

This evaluation employed a mixed-methods approach, incorporating both qualitative and quantitative research methodologies. Data collectors were trained and mentored by project leads to ensure the accuracy and consistency of the data collection process. An overview of the data collection tools used, along with their descriptions and associated data collection processes, is provided in table 1.

The evaluation began with a contextual analysis, which involved a brief literature review to compile background information on socio-political, humanitarian and health-system factors and considerations that influence the relevance of the WHO-NCDK to the setting. Qualitative data were collected through semistructured interviews with key informants from relevant facilities (facility managers and pharmaceutical supply personnel), Federal Ministry of Health (FMoH) and WHO in-country staff and representatives of the United Nations High Commissioner for Refugees (UNHCR). Question guides were tailored to focus on the extent and type of engagement with the WHO-NCDK among participants. The interviews included questions about the kit ordering and deployment process, NCD management burden and participants' recommendations to improve NCD care. The interviews were conducted in person in English.

To collect information about the health system infrastructure and availability of services, a health facility assessment survey was used. This survey was derived from the WHO's HEARTS technical package[16] and aligned with the WHO package of essential noncommunicable disease interventions (WHO-PEN)[17] for primary healthcare. A pharmaceutical supply chain survey (Medication Supplies—General) was used to establish background supply chain information and capacity to receive and store the kit content appropriately. For quantification of the remaining kit contents, an enhanced version of the

Table 1 Data collection methods and processes

Method	Tool description	Data collection/data processing
Contextual analysis	Compile background information on the socio-political, humanitarian and health-system factors and considerations that influence the relevance of the WHO-NCDK to the setting	A brief and cursory literature review of NCD-related research was conducted using Google Scholar and PubMed. Information about the health system came from various WHO documentation
Key informant interviews	Semistructured interviews for collecting general information on the relevance of the WHO-NCDK. Different guides were used for interviews with health facility managers and other stakeholders	Interviews were recorded and transcribed for analysis. A qualitative analysis was conducted using a theoretical framework to organise quotations from the interviews. The thematic analysis was organised to capture the following themes: NCD burden, diagnosis, drugs/equipment, staff and training, guidelines, kit logistics, kit impact on quality-of-care and future plans for NCD care
Health facility assessment	Survey to collect information around the health system infrastructure and availability of services	Data were collected retrospectively, after the kit had been used for approximately 20 months, through observations and interviews with health facility staff
Medication supplies—general	Survey to collect supply chain information to assess whether the WHO-NCDK were received and stored appropriately	Data were collected retrospectively, after the kit had been used for approximately 20 months, through observations and interviews with health facility staff
Medication supplies—stock list	Survey to collect information on the WHO-NCDK effectiveness in improving the capacity to manage NCDs and to calculate the remaining kit contents	An IRC consultant in Sudan recorded the inventory at each facility. The inventories included 23 medications and 14 supplies and equipment included in the WHO-NCDK. In addition, the tool aimed to assess eight supplies and equipment that are not covered by the WHO-NCDK as well as seven additional essential pharmaceutical classes for NCDs*—actual quantities were collected, availability of pipeline stocks, average monthly consumption rates and the number of occasions where a facility experienced stock-out for seven consecutive days (during the last 90 days before the evaluation day)
Clinical staff survey	Survey to collect background information with three sections to assess (1) general professional background, (2) perceptions around NCD management and the challenges therein, (3) knowledge and operationalisation of the WHO-NCDK	A short multiple-choice survey with open-ended questions was self-administered on paper to healthcare workers managing NCDs. The survey was administered in English
Quality-of-Care (QoC)	Patient record auditing tool to assess the quality of patients' records and gauge the QoC offered	A random sample of patient charts was systematically screened using a standardised tool. This tool included criteria for identifying patients who had received outpatient consultations for hypertension, diabetes, asthma, COPD and/or epilepsy within the preceding 90 days. In addition, the tool assessed whether the patients' disease control biomarkers were accurately recorded and identifiable within their charts

*Additional screened items included (defibrillators, ECG machines, nebulisers, full oxygen cylinders, pulse oximeters, spacer devices for inhalers, visual acuity charts, and weighing machines) for equipment and supplies, and (statins, general opiates, sympathomimetic agents, antihypertensives, anticoagulants, general anti-anxiety medications and anticholinergics) for other pharmaceutical classes/medicines not included in the 2016 version of the WHO-NCDK.
COPD, chronic obstructive pulmonary disease; IRC, International Rescue Committee; NCD, non-communicable disease; WHO-NCDK, World Health Organization Non-Communicable Diseases Kit.

Dharma tool was used—a tool developed by WHO EMRO and partners to calculate the WHO-NCDK remaining items and their utilisation rates. This tool allowed for consistency and facilitated comparisons with other WHO-NCDK evaluations. HCWs managing NCDs completed a short multiple-choice survey with open-ended questions (Clinical Staff Survey). The survey gathered background information and evaluated HCWs' perceptions around NCD management, the challenges therein, and their knowledge and operationalisation of the WHO-NCDK. In this evaluation, a QoC tool was used to audit patient records, using a randomised sampling technique. The tool was piloted in a single health facility to facilitate adjustments to both the tool and protocol. The QoC tool included screening questions for patients who received outpatient consultations in the past 3 months for hypertension, diabetes, asthma, chronic obstructive pulmonary disease (COPD) and/or epilepsy, and their disease

control biomarkers were recorded/recognisable in their charts.

Descriptive statistical methods were used for quantitative data, and content analysis was applied to open-ended questions. After conducting interviews and gathering quotations, a thematic analysis was performed. The resulting findings, along with the results obtained from other tools, were presented using the WHO Building Blocks framework as applicable. In consultation with the WHO and project leads, the findings were further categorised into the following predetermined themes:

- Predeployment needs assessment and procurement.
- Logistical capacity, repackaging and delays with kit distribution.
- Kit content quantification analysis, acceptability, and relevance to local practice.
- Health system and human resources readiness.

The data were collected through physical observations, interviews with relevant staff, and further recorded on paper-based surveys and/or on tablets using the CommCare Software,[18] where possible. The evaluation was completed in September 2022. Written and verbal consents were collected where relevant.

FINDINGS AND DISCUSSION

Data were collected through various methods, including a literature review, key informant interviews, health facility assessment surveys, medication supply surveys, clinical staff surveys and a QoC patient record auditing tool. Seven key informant interviews were conducted with staff from the two health facilities, including facility managers and pharmaceutical supply personnel, in addition to WHO in-country staff, and representatives of the UNHCR and FMoH. Two health facility assessment surveys and two medication supply surveys were completed retrospectively, after the WHO-NCDK had been used for approximately 20 months. In addition, a medication supply stock list survey was conducted for each facility. The clinical staff survey was self-administered to 15 HCWs managing NCDs, with the survey completed by eight HCWs from Al-Yarmouk PHC centre and seven from the IRC PHC centre in Gedaref. The QoC tool was completed for a total of 60 patient charts across both settings, with 30 patient charts audited for each facility, including the pilot data for Al-Yarmouk PHC centre. The collected data provided valuable insights into the implementation and effectiveness of the WHO-NCDK and the management of NCDs in the evaluation settings. In the following sections, we present these findings and discuss their implications:

Predeployment needs assessment and procurement

Service delivery

Participants including FMoH officials, WHO and UNHCR representatives, facility members and HCWs reported that poor access to medicines and supplies, as well as frequent drug shortages, have all impacted the management of NCDs. Quantitative and qualitative findings showed that hypertension is more burdensome than diabetes and the participants highlighted both diseases are greatly contributing to the burden of cardiovascular diseases (CVDs). According to WHO estimates, CVDs are most prominent in Sudan and responsible for 28% of all mortality.[12] Notably, mental health conditions were also reported to be adding to the burden and present a considerable problem as the nation has been exposed to long duration of prescription drug shortages, civil wars and, more recently, the COVID-19 pandemic.[12 19 20] However, there was a general lack of awareness of the actual burden of NCDs among participants. Only two national-level informants referred to Sudan's 2016 STEPwise survey (WHO STEPwise approach to NCD risk factor surveillance).[9] Qualitative findings revealed that in the first few months after deployment, both facilities had limited needs for the WHO-NCDK content. The Mayo facility was a new establishment and unknown to the surrounding communities, while the facility in Tunaydbah did not have structured NCD services. However, despite these initial challenges, the readiness to use the WHO-NCDK was higher in the two facilities in Sudan compared with the assessed facilities in Yemen and Libya.[4] This was likely due to pre-existing technical and financial support provided by WHO and FMoH, which possibly had a positive impact on the kit uptake and relevance to the local context.

Health workforce

This evaluation showed that the number of HCWs was generally inadequate across all disciplines; there were typically two to three medical officers in each facility and only one or two people employed to cover other health cadres. The high staff turnover was highlighted by most participants as a challenge for NCD service provision and training efforts. Recent statistics showed that Sudan had 1.9 physicians per 10 000 people, and the nurses and midwives density rate was 7.9 per 10 000 people.[21]

Health information systems

Both facilities provided walk-in services only, as no appointment systems were in place. A mix of record-keeping systems was observed: one facility used a combination of patient-held files and a registry, whereas the other setting relied on the registry solely. No electronic Health Information System was in use, and no NCD-specific registers or tracing systems were used to improve the continuity of care in both facilities. The lack of patient file retrieval systems and the use of patient-held record-keeping practices have further hindered the quality of the evaluation data. To enhance the utilisation and effectiveness of the WHO-NCDK, as well as the QoC offered, improvements are necessary in patient records, clinical documentation and tracking systems for disease biomarkers. Digital

health interventions, such as the use of electronic health records, NCD-specific registers or tracing systems, could play a pivotal role in achieving these improvements.[22]

Logistical capacity, repackaging and delays with kit distribution

Leadership and governance

Assessing leadership and governance were beyond the scope of this evaluation, and as such, no specific data were collected in this area. It is worth noting that the IRC is responsible for the management of both facilities, and a decision was made before deployment to have the basic module for NCDs and mental health medicines assembled in the IRC central warehouse in Khartoum, and to facilitate faster delivery and avoid delays as previously experienced in Yemen, Libya and South Sudan. Due to a lack of sufficient funding at the time of deployment, the central warehouse and the facilities did not have any capacity to store/dispense insulin or other cold chain pharmaceuticals. Therefore, assembling the cold chain/insulins module was not possible. The IRC staff who were involved in the distribution process reported that it took approximately 2 weeks before reaching their final destinations. However, assembling the WHO-NCDK locally was only possible due to the nature of the emergency in Sudan, which is different from Libya, Yemen and South Sudan, where all the three countries were classified as emergency settings with active conflicts at the time of deployment. Nevertheless, our findings revealed that additional WHO-NCDKs will be deployed in Sudan through the regular supply channels, but these kits were also facing delays in their delivery process. These challenges highlight the importance of effective leadership and governance in ensuring the timely and efficient delivery of medical kits in emergency settings.

Kit content quantification analysis, acceptability and relevance to local practice

Service delivery

Stakeholders confirmed that the WHO-NCDK was relevant for their facilities and reflected on the overall acceptance of its content among patients and prescribers. However, a need for repackaging the WHO-NCDK for relevant diseases and revising its contents and quantities was reported. Due to several challenges, some kit items lasted for more than the projected 3 months. As both facilities receive medicines from other sources, it is likely that the NCD drug quantities found in this evaluation were confounded/obtained outside the kit.

Health workforce

Addressing the capacity of HCWs is crucial for ensuring the effective delivery of healthcare services. For example, the uptake of mental health drugs has improved over time as a result of the given attention and training efforts from WHO, FMoH and other partners. However, the management and human resource capacity of the Sudanese healthcare system is weak and varies by the ratio and type of HCWs, and it is particularly biased towards urban geographies.[23] The migration of HCWs due to economic factors, political unrest and inadequate training opportunities is high. According to estimates, 25% of pharmacists and 60% of doctors work abroad.[21]

Medical products

Analysis of the quantification data indicated scarcity of several basic NCD medicines and reported several occasions of stock-outs lasting for seven consecutive days—in the most recent 90 days before the evaluation. Despite methodological limitations, it is plausible that the asthma/COPD medicines found in both settings were sourced 20 months ago from the WHO-NCDK. Clearly, these medicines lasted longer than the original plan as indicated by the quantified items, consumption rates and the interviews. For CVD medicines, the reported average monthly consumption rates varied between medicines and facilities, yet certain pharmaceutical classes had comparable trends and higher consumption than other WHO-NCDK medicines—possibly relevant to diseases burden, sociodemographic factors, utilisation trends and the local clinical guidance followed,[9 12 19 20 24] for instance, high uptake of calcium channel blockers and lower uptake of ACE inhibitors. For diabetes, both facilities had access to oral hypoglycaemic agents only. Stocks of essential medicines to treat mental health conditions were accessible, but their stock quantities varied marginally. The interviews revealed that services were recently introduced in Al-Yarmouk PHC facility and scheduled for launch in the other centre, and utilisation trends were expected to increase, especially after the delivery of planned mental health training. The WHO-NCDK content for hypothyroidism was donated due to near expiry dates since the need for this medication was extremely minimal in both settings. Access to general equipment and supplies was limited, as highlighted during interviews and facility assessment and clinical staff surveys. This was mainly due to supply chain issues and financial constraints.

Health system and human resources readiness

Service provision, delivery and quality-of-care

The WHO-NCDK was found to improve service availability for NCDs, particularly during times of supply chain disruptions. However, service availability for NCDs was generally inadequate due to several challenges including access to a wide range of NCD medicines and laboratory services, staff turnover, limited patient counselling/education and the lack of community-level activities among other factors. Facility surveys and key informant interviews showed several gaps in the availability of NCD clinical guidelines tailored for PHC. While the interviews revealed an appreciation for humanitarian efforts in providing PHC guidance, a clearer guidance was thought vital and had to be following national guidelines. High-level participants confirmed the development of national NCD guidelines tailored

for PHC and focusing on hypertension, CVDs, rheumatic heart disease and diabetes; asthma and COPD guidelines are not yet adapted. The interviews also indicated that the QoC has increased after receiving the WHO-NCDK, despite the lack of adequate documentation to reflect on the QoC. Auditing patient records further confirmed the latter finding as only 42% of the NCD outpatient consultations included disease control biomarkers in one of the facilities. The QoC findings of the assessed facility records showed that >40% of patients had uncontrolled blood pressure which is higher than what was reported in the national STEPwise survey (31.5%).[9] However, we were unable to confirm whether the WHO-NCDK has improved the QoC as a result of data gaps.

Health workforce

Clinical staff perceptions indicated that the biggest challenges for the management of NCDs were the lack of laboratory services and poor access to medicines and equipment. Other challenges included the lack of dedicated NCD clinics to facilitate patient management and follow-up, limited availability of guidelines, lack of training, inadequate staffing, the scarcity of community-based NCD activities and poor patient records and filing systems, all of which have added to the burden of NCDs. These obstacles were similar to what was reported in the interviews, prior WHO-NCDK assessments and in other studies in similar settings.[4 25 26] Nearly three-quarters (n=11/15, 73%) of the clinical staff survey participants reported having never received any mental health training. Details of the 15 clinical staff who completed the short multiple-choice survey are presented in table 2.

Participants who were aware of the WHO-NCDK (n=7, 47%) had favourable perceptions and positive opinions of the kit, and the modular WHO-NCDK design was found to be practical and relevant. In contrast to what was reported in Yemen, patients' dissatisfaction with quality based on place of manufacture (country of origin) and acceptance of trademarks versus generics were not present in Sudan. Interviewees highlighted that most patients are unaware of their prescribed medicines and do not notice such changes. Overall, the WHO-NCDK was seen as an ideal solution for the Sudanese context as it addresses recurrent drug shortages and supply chain disruption, unavailability of services and the limited affordability of medicines among people living with NCDs.

Health information

In contrast to the previous findings in Yemen, Libya and South Sudan,[4] the current evaluation outlined the presence of different modalities to support different regions as per local needs and further indicated the existence of M&E systems in place. However, neither facility used any electronic platforms, NCD-specific registers or tracing systems to improve the continuity of care or assess the uptake of the WHO-NCDK content.

Table 2 Profiles of clinical staff survey participants

General overview of NCD services and staff demographics/ profiles	IRC PHC centre in Mayo settlement n (%)	IRC PHC centre in Tunaydbah camp n (%)	Total n (%)
Survey respondents	8 (100)	7 (100)	15 (100)
Years of experience			
<1	3 (38)	2 (29)	5 (33)
1–2	3 (38)	4 (57)	7 (47)
3–5	2 (25)	1 (14)	3 (20)
Cadre			
Health medical assistant	1 (13)	1 (14)	2 (13)
Medical laboratory technician	0 (0)	1 (14)	1 (7)
Nurse	0 (0)	1 (14)	1 (7)
Pharmacist	1 (13)	2 (29)	3 (20)
Medical officer	6 (75)	2 (29)	8 (53)
Mental health training*			
No	6 (75)	5 (71)	11 (73)
Yes†	2 (25)	2 (29)	4 (27)

*Mental health training topics included depression, anxiety, psychosis and schizophrenia, among others
†Three medical officers and one health medical assistant (prescriber)
IRC, International Rescue Committee; NCD, non-communicable disease; PHC, primary healthcare.

Health financing

While our operational evaluation did not aim to specifically assess health financing in both settings, we collected general data from the literature and from the health facility assessments surveys to provide a broader context of the situation in the assessed areas. Although both centres reported providing free NCD services and medications, respondents reported that patients still encounter out-of-pocket (OOP) payments to acquire prescriptions. The WHO global health expenditure database showed that household OOP spending (among the Sudanese public) on health accounts for roughly 70% of total spending in 2018. Almost 80% of these costs are spent on curative care with 19% going toward medications/supplies. Nearly half (49%) of the total health expenditure is for NCDs. As such, additional efforts must be made to consolidate and improve existing health financing programmes as poverty in Sudan is multifaceted and experienced in a number of interconnected dimensions.[10] These efforts are particularly important to support the needs of the most vulnerable who are living in remote areas including refugee camps.

Table 3 Recommendation for future kit use

Recommendation	Rational/description
Establishing/strengthening a systematic process for predeployment needs prior to shipping future kits	To ensure the kit is relevant and necessary to the local context, designing specific tools/forms could support decisions to distribute the WHO-NCDKs or halt further orders if needs were found to be limited
Establishing/strengthening monitoring and evaluation (M&E) systems	Provision of standardised M&E tools such as logs, frameworks and forms could support effective utilisation of the kit and provide insight on regional burden of NCDs as well as the QoC provided. This would address a significant gap in NCD data collection and help to increase visibility and understanding of the burden of NCDs
Strengthening collaboration and communication between stakeholders	Future collaborations must consider local/national and humanitarian efforts; multiple stakeholders were found to support guidelines development and field staff tend to follow national guidance. A quicker delivery process is required to ensure efficacy of the kit. It is recommended to incorporate the WHO-NCDK deployment system via a common distribution channel and ensure communications with facility/staff focal personnel
Assigning relevant WHO standard emergency health kits according to local capacity and need	Revise the IEHK and reduce its NCD content and aim to use it in settings with low NCD burden, low apparent burden and/or places with little capacity to manage NCDs; reserving the WHO-NCDK for higher burden areas (where the infrastructure and capacity to manage these conditions are better established) and also avoid wasted medicines
Reviewing the WHO Non-Communicable Diseases Kit (NCDK) content	Observations from previous and current WHO-NCDK evidence demonstrated a need to review its content and modular design. It is suggested to be flexible about the specific items to be included, as well as their quantities, strengths and dosage forms as required locally. It would be ideal to organise the WHO-NCDK items by level of service delivery, regional NCD burden, and by considering the capacity and training of HCWs in each service delivery level in accordance with local practices and guidance followed
Reframing the WHO-NCDK contents into further subcategories	The WHO-NCDK modules could be reframed by separating out medicines and supplies into further subcategories by the NCD type, for example, cardiovascular disease submodule. Considerations for a minimum package of essential mental health services at PHC level should also be made and rolled with comprehensive training in the future
Capacity strengthening of healthcare workers (HCWs)	The past and present evaluations have revealed several gaps in NCD training; as such, trainings should be implemented before or concurrently with the deployment of the WHO-NCDK, including periodic refreshers to guarantee HCWs are comfortable and competent in using the kit. Solutions to improve local staff retention must be factored in policies to ensure revenue on the investment of organisational efforts around training
Ensuring the model of non-communicable disease (NCD) service integration is defined prior to the deployment of commodities	Establishing a separate NCD clinic is expected to improve the quality of services as health counselling, patient education and record-keeping practices are likely to be improved when provided systematically. Provision of up-to-date resources, materials and guidance to facilitate patient awareness
Improving patient registries and records	Improving registries, patient records including good documentation practices to record disease biomarkers (patient tracking systems) to enable assessment of patient outcomes. Systems for capturing real-world evidence through health information and patient record systems are highly recommended to further explore the kit effectiveness from patient perspectives; to further understand the social circumstances, environmental and physical influences, behaviours and the quality of medical care provided
Ensuring quality of service delivery	When deploying the WHO-NCDK, it is crucial to ensure availability of guidelines and protocols adopted to the local context, with systematic, aligned M&E procedures to evaluate patient outcomes
Development of an essential medicine list for NCDs at the PHC level	To facilitate the transition into normal supply chain channels in the future, the establishment of an essential medicine list for NCDs at the PHC level with connections to existing national guidance and training is strongly recommended
Ensuring the continuity of relevant COVID-19 adaptations	Strategies that were used to modify/adapt care during the COVID-19 pandemic to ensure continuity of care when services were interrupted must be maintained. It is important to sustain and not abandon some of these adaptations, such as remote consultations and follow-ups, triaging to improve safety of care for patients, prescribing practices and the expanded role of community health workers

IEHK, Interagency Emergency Health Kit; PHC, primary healthcare.

CONCLUSION

This operational evaluation described the implementation of the WHO-NCDK and presented lessons learnt from the kit use in Sudan. While the kit was well appreciated by HCWs and other key stakeholders, the findings suggest that the kit's effectiveness is dependent on the health system supply chain and the capacity of facilities and HCWs. Local facility needs and staff capacity to manage NCDs must be addressed prior to kit shipments to ensure the relevance and maximise its utility. In order to provide a more comprehensive view of access to medicines and management of NCDs in humanitarian contexts, further analysis of the existing literature is needed. Nevertheless, our evaluation highlights some important aspects of NCD management in the context of emergency settings. For instance, the excess drugs for some conditions and near stock-out of others were seen as a reflection of management challenges. In addition, the control levels of some diseases, such as hypertension, can provide insight into management practices. This evaluation confirmed that NCD service uptake and utilisation trends are also dependent on the served community. Although CVDs including hypertension possess the highest burden in the nation, further evidence is needed to understand the epidemiological trends of other NCDs such as asthma, COPD and hypothyroidism, to ensure they are not left behind. The directed efforts for mental health have demonstrated progress in service provision, yet additional support is still needed to provide sufficient care for other NCDs and their exacerbations. The current findings reinforce the role of the WHO-NCDK in maintaining continuity of care by providing essential medicines and equipment in times of supply chain disruptions. The evaluation highlighted the importance of addressing local communities' awareness of available health facilities and services, strengthening the integration of NCDs into PHC, improving the M&E systems and strengthening surveillance systems. These insights can inform efforts to enhance the utility and usefulness of the WHO-NCDK in future implementation and the QoC offered for NCDs more generally. Other key learnings and recommendations for future WHO-NCDK use were homogenous with prior findings and are summarised in table 3.

Our analysis has certain limitations that should be considered. The evaluation was delayed as the local IRB approval was slow during a period of political unrest. It is also plausible that the COVID-19 pandemic might have affected the findings because of its impact on health systems.[27–29] Unlike previous evaluations,[4] data gaps were clearly minimal due to the set-up of M&E systems; however, service utilisation questions were completed differently between the facilities and limited their comparability. The pharmaceutical stocks were a mix of products received from the WHO-NCDK and other sources which limited the generalisability of findings. In addition, the dependence of the examined sites on IRC support may also impact the applicability of the findings to non-IRC supported settings. The patient record auditing was only completed in one facility, while the other used patient-held records, which limited the data collection. Some of the evaluation tools depended on the respondents' memory and self-reporting, and recall bias was not considered when the tools were originally designed and piloted. It is likely possible that the data were confounded by social desirability and fear biases. Given the implementation environment, it was hard to maintain consistent sample sizes and adhere to strict protocol methodologies. However, we believe the data provided valuable information that can be triangulated with previous WHO-NCDK documentations and other findings from similar settings.[2 4 6 30]

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