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Rubber stamp templates for improving clinical documentation: A paper-based, m-Health approach for quality improvement in low-resource settings

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ABSTRACT

Background: The United Nations' Sustainable Development Goal #3.8 targets 'access to quality essential healthcare services'. Clinical practice guidelines are an important tool for ensuring quality of clinical care, but many challenges prevent their use in low-resource settings. Monitoring the use of guidelines relies on cumbersome clinical audits of paper records, and electronic systems face financial and other limitations. Here we describe a unique approach to generating digital data from paper using guideline-based templates, rubber stamps and mobile phones.

Intervention: The Guidelines Adherence in Slums Project targeted ten private sector primary healthcare clinics serving informal settlements in Nairobi, Kenya. Each clinic was provided with rubber stamp templates to support documentation and management of commonly encountered outpatient conditions. Participatory design methods were used to customize templates to the workflows and infrastructure of each clinic. Rubber stamps were used to print templates into paper charts, providing clinicians with checklists for use during consultations. Templates used bubble format data entry, which could be digitized from images taken on mobile phones. Besides rubber stamp templates, the intervention included booklets of guideline compilations, one Android phone for digitizing images of templates, and one data feedback/continuing medical education session per clinic each month. In this paper we focus on the effect of the intervention on documentation of three non-communicable diseases in one clinic.

Methods: Seventy charts of patients enrolled in the chronic disease program (hypertension/diabetes, n = 867; chronic respiratory diseases, n = 223) at one of the ten intervention clinics were sampled. Documentation of each individual patient encounter in the pre-intervention (January–March 2016) and post-intervention period (May–July) was scored for information in four dimensions – general data, patient assessment, testing, and management. Control criteria included information with no counterparts in templates (e.g. notes on presenting complaints, vital signs). Documentation scores for each patient were compared between both pre- and post-intervention periods and between encounters documented with and without templates (post-intervention only).

Results: The total number of patient encounters in the pre-intervention (282) and post-intervention periods (264) did not differ. Mean documentation scores increased significantly in the post-intervention period on average by 21%, 24% and 17% for hypertension, diabetes and chronic respiratory diseases, respectively. Differences were greater (47%, 43% and 27%, respectively) when documentation with and without templates was compared. Changes between pre- vs.post-intervention, and with vs.without template, varied between individual dimensions of documentation. Overall, documentation improved more for general data and patient assessment than in testing or management.

Conclusion: The use of templates improves paper-based documentation of patient care, a first step towards improving the quality of care. Rubber stamps provide a simple and low-cost method to print templates on demand. In combination with ubiquitously available mobile phones, information entered on paper can be easily and rapidly digitized. This 'frugal innovation' in m-Health can empower small, private sector facilities, where large numbers of urban patients seek healthcare, to generate digital data on routine outpatient care. These data

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can form the basis for evidence-based quality improvement efforts at large scale, and help deliver on the SDG promise of quality essential healthcare services for all.

1. Introduction

The majority of primary healthcare clinics (PHC) in Kenya are staffed only by non-physician clinicians (NPCs) such as nurses and clinical officers [1]. NPCs are quickly becoming the mainstay of healthcare service delivery in low and middle-income countries (LMICs). In 2007, the number of NPCs equaled or exceeded that of physicians in nine sub-Saharan countries, and by 2010, NPCs were recognized in 47 of the 54 African countries [2]. There are arguments for clinical officers, a cadre of NPC in Kenya, to play the role of professional 'primary care clinician' [3].

Alongside the increasing role for NPCs, another important shift in the landscape of primary healthcare in LMICs is the growth of the private sector, which is likely to play a major role in attempts to achieve universal health coverage (UHC) [4]. For example in Kenya, 60% of urban and 35% of rural primary care facilities are classified as private, for-profit [1]. The private sector in primary healthcare is however diverse and fragmented, ranging from single owner-managed clinics, small general clinic chains managing a few facilities, to large franchise chains (mainly delivering reproductive health services) [5]. Private sector primary healthcare clinics (PS-PHC) in general, and particularly many in challenging settings like urban slums or remote, rural areas, have little support to help improve quality of their care [5,6]. Many are poorly resourced [7], and lack support for engaging in quality improvement (QI) efforts.[1]

One of the targets under the UN Sustainable Development Goals (SDGs) #3 is to achieve 'access to quality essential health-care services' (SDG #3.8). Efforts to achieve this target must therefore focus on the role of NPCs as primary care clinicians, and capacity in the private sector to deliver quality essential healthcare services. Increased utilization of healthcare services does not guarantee improvements in health outcomes, highlighting the need for QI efforts to promote evidence-based care [8].

Clinical practice guidelines (CPG) are an important tool for ensuring quality, evidence-based clinical care. However, there are many challenges to implementing CPGs in low-resource settings, especially in monitoring their use and supporting healthcare professionals to adhere to them [9–11]. Current efforts to measure and improve quality of clinical care are expensive and cumbersome, including manual audits of paper records [12], direct observations of clinical care [13], or standardized patients [14]. As a result, clinical quality in LMICs is commonly measured mostly through service measures (e.g. waiting times, availability of infrastructure, patient satisfaction), and rarely through technical measures (e.g. provider competence, adherence to CPGs) [15,16].

Electronic technologies, and electronic medical record (EMR) systems in particular, are seen as the main solution to improving the generation of data required for QI efforts [17,18]. However, besides functionality and technical infrastructure, few implementations of EMRs in LMIC settings have considered political, ethical or financial criteria that could help improve their use [19]. Use of such systems remains low outside of well-funded, vertical disease programs [20], and many design, human resource, logistical and financial barriers need to be addressed before such technologies can be routinely used to support primary healthcare service delivery in LMICs [21,22]. There are numerous reasons why paper continues to be used as an interface for medical documentation [23,24], and paper-based documentation is almost ubiquitous in LMIC settings. The use of clinical records for QI is therefore tightly linked to paper-based documentation, and the ability to analyze the information contained in paper-based patient charts.

The Guidelines Adherence in Slums Project (GASP) in Nairobi, Kenya, has pioneered an innovative approach of retaining paper as the interface for documentation, while simplifying the digital extraction of medical information from paper [22]. The project uses rubber stamps to print, on demand, specific CPG templates onto paper-based patient charts (Fig. 1). Each rubber stamp CPG templates (RST) is specific to a disease/condition and incorporates important diagnostic and therapeutic recommendations. Extending the use of checklists for medical safety [25], RSTs also include data entry fields which can be digitized using a mobile phone camera and linked software. The approach therefore combines: a) paper-based interfaces for use during clinical encounters, b) condition-specific checklists that aide the clinician in managing a range of commonly encountered illnesses in the outpatient setting, and c) digital data extraction and management.

In this paper we examine the effect of using RSTs on clinical documentation in paper-based charts. The report focuses on documentation related to the management of three non-communicable diseases (NCD) in one PS-PHC. We discuss the links to improving quality through adherence to CPGs, especially for PS-PHCs, the benefits and limitations of template-based documentation, and the use of paper, rubber stamps and mobile phones as a 'frugal innovation' for generating digital health information in LMIC settings. Separate reports will describe the effect of RSTs on improving adherence to CPGs, the acceptance and use of RSTs (and related technology) by NPCs and managers of PS-PHCs, and the technology for extracting digital data from RSTs.

2. Methods

2.1. The intervention

GASP was a mixed methods study targeting ten PS-PHCs serving populations living in the urban informal settlements of Nairobi, Kenya. The intervention included four elements, all of which were implemented at every facility. These included:

1) Rubber stamps of CPG templates: RSTs were developed for some of the commonly encountered clinical conditions in the outpatient setting (Fig. 1). These included, for example, upper respiratory tract infections, urinary tract infections, hypertension, etc. Each facility was free to choose the RSTs to implement, with the possibility to change anytime during the project. RSTs were developed using participatory approaches. Clinicians and/or managers at each facility were provided a draft of the RST. The research team then worked with the facility staff to adapt the RSTs to suit their workflow and available infrastructure. The constraints of rubber stamps (e.g. size limited to ~10 × 7 cm, the size of commonly available ink pads) and template-based documentation (e.g. capturing discrete and not continuous data) were explained to the clinicians, along with their advantages (e.g. printing templates on demand versus managing stacks of pre-printed paper). Each RST included a checklist of selected elements under four broad aspects of clinical documentation: general data (e.g. high-risk age groups, HIV status), assessment (e.g. documentation of complications, if any, of diabetes), testing (e.g. documentation of blood sugar levels), and management (e.g. prescription of drug class, documentation of counselling provided). One set of RSTs and one ink pad were provided for each consultation desk/room at every facility. Clinicians were asked to use a relevant RST for each consultation if possible.

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