LESSONS FROM THE FIELD

Recording errors in homemade home-based records to record vaccination services: results from the 2016 Kenya Missed Opportunities for Vaccination Assessment

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ABSTRACT

Problem: Homemade home-based records (HBRs) are often used to replace official HBRs during stock-outs. By their nature, homemade HBRs are often ad hoc in form and lack structure which may lead to immunization service delivery recording errors.

Approach: We reviewed electronic photographic images of HBRs presented by caregivers attending primary care clinics with children aged <24 months.

Local Setting: The study was a secondary analysis of information collected during the 2016 Kenya Missed Opportunities for Vaccination (MOV) Assessment conducted by the Kenya Expanded Programme on Immunization alongside its partners.

Observations: Of 512 unique HBR images for review, 9% were of homemade records which most often were a simple, ruled notebook on which the services delivered and dates of service were recorded by health workers. The image review identified several examples of errors related to the absence of standardized vaccine naming in record and the absence of structured areas for recording each recommended vaccine-dose.

Lessons Learnt: Lacking structure observed in homemade HBRs may compromise recorded data integrity and ultimately may impact a health worker's decision making and ability to counsel caregivers about which vaccines and doses her child has received and which remained outstanding. Whenever possible, use of photocopies of the official HBR is preferred to homemade HBRs.

Key words: home-based records, recording, data quality, vaccination, missed opportunities

INTRODUCTION

Structure and form matter in the design of a home-based, personal health record [1] used to record infant vaccination history. The home-based record (HBR) serves both as a place for recording dates of vaccination (and other primary care services) by health workers and is a communication tool that extends the health worker / caregiver relationship beyond their direct contact during a health encounter. Thus, the HBR benefits from thoughtful, well-organized form design layouts that align with health worker needs for fast eye scan and rapid assessment of vaccination history; from structured fields that facilitate uncomplicated, legible and accurate recording; from structured, common language, such as a standard set of names for vaccines pre-printed on the record; from designated areas indicating the number of doses of a given vaccine that a child is expected to receive and that communicate what disease the vaccine protects against. Ultimately, well-designed HBRs will help both health workers and caregivers interact with and navigate the HBR more easily, facilitating reductions in recording errors and improving uptake and ownership.

When official, standardized HBRs are not available due to stock-outs [2,3] or are lost or damaged, replacement HBRs are often used. Replacement HBRs are sometimes simple photocopies of the official HBR. In other instances, replacement HBRs are homemade documents created using notebooks or loose-leaf paper. In this report, we highlight that the use of homemade HBRs, which often lack structure and form, contributes to mistakes and information gaps that undermine the function of the HBR.

LOCAL SETTING

The Kenya Expanded Programme on Immunization (KEPI) began in 1980 as a unit within the Ministry of Health with the overall goal of immunizing all children in the country against tuberculosis, diphtheria, tetanus, pertussis, polio and measles. At the end of 2016, KEPI recommended vaccines targeting 13 vaccine preventable diseases (Table 1).

APPROACH

Our study was a secondary analysis of information collected as part of the 2016 Kenya Missed Opportunities for Vaccination (MOV) Assessment [6]. We reviewed photographic images taken of HBRs presented by caregivers attending primary care clinics with children aged <24 months in selected communities located in Bungoma, Kajiado, Kiambu, Kitui, Migori, Mombassa, Nakuru, Taita Taveta, Trans-Nzoia and West Pokot counties. WHO's MOV strategy and assessment methods are available online [7], and a detailed description of the 2016 Kenya MOV Assessment is provided elsewhere [8].

We reviewed a total of 703 images taken as a part of the assessment. Of these, 53 images were not HBRs and were excluded, leaving 650 HBR images. Of the 650 remaining images, we identified 138 duplicate images, leaving 512 unique HBR images for review.

OBSERVATIONS

Of the 512 HBR images, 467 (91%) were official HBRs, meaning they were issued by a health authority such as the Kenya Ministry of Health or a private clinic. Across these official HBR images, we identified 13 different HBR formats. A total of 96 (9%) of the 512 HBR images were of homemade records. These are the focus of this note.

The identified homemade HBRs were most often created using a simple, ruled notebook on which the services delivered and dates of service were recorded by health workers. Each replacement HBR was unique from the next with distinctive structures and styles for recording vaccination history. When reviewing the images of homemade HBRs, we identified several examples of potential errors related to absent structure that compromise the function of the HBR. These are described below.

Error related to absence of standardized vaccine naming in record

In Figure 1, panel A, we observe that the health worker recorded that a first dose of diphtheria-pertussis-tetanus toxoid vaccine (DPT1) was administered on 19 August 2016. A second dose of pentavalent DPT-HepB-Hib vaccine (Penta2) was administered on 3 November 2016. The potential error

of concern is the recorded information for DPT containing vaccine on 19 August. According to information submitted to the WHO, in 2016, KEPI was using pentavalent DPT-HepB-Hib vaccine, *not* trivalent DPT vaccine. Some might argue that no error exists; DPT-HepB-Hib vaccine is often referred to as DPT containing vaccine, or just DPT in shorthand. However, if the child in fact received a first dose of DPT vaccine, either outside of Kenya or in a private clinic, then the child has received only a single dose of vaccine against Hepatitis B and *Haemophilus influenzae* disease (that received on 3 November). Knowing whether the 19 August entry is a recording error or whether the child received DPT or DPT-HepB-Hib vaccine is important. If the child did not receive the appropriate number of doses of DPT-HepB-Hib vaccine, then the child may not be protected against hepatitis B and *Haemophilus influenzae* disease.

Error related to absence of structured areas for recording

In Figure 1, panel B, we see that a health worker recorded the following vaccines, administered on 3 June 2016: Penta3 (pentavalent DPT-HepB-Hib vaccine, third dose), OPV3 (oral polio vaccine, third dose), $PCV_{10}3$ (10-valent pneumococcal conjugate vaccine, third dose), Rota3 (rotavirus vaccine, third dose), and IPV (inactivated polio vaccine). Because Kenya's national immunization schedule recommended a two-dose rotavirus vaccine in 2016, the error of concern is the recorded information for Rota3.

Several scenarios are possible. One, the child may have unnecessarily received a third dose of rotavirus vaccine. Two, the child may have received their second dose of rotavirus vaccine, but the dose was mis-recorded in the document in succession with other vaccines administered that were all third doses. Or three, because administering a third dose of rota virus vaccine runs foul to the recommended schedule, the recording may not be reflective. That is, the child may not have received a dose of rotavirus vaccine at all. A second example of the same recording error is shown in Figure 1, panel C. Structured fields for each recommended vaccine-dose combination, per the national immunization schedule, along with the disease(s) targeted, are critical for averting confusing entries that might result in immunization service delivery errors.

A similar example is shown in Figure 1, panel D. The health worker recorded the following vaccines administered on 5 September 2016: Penta3, Polio3 (presumably OPV, but unspecified), PCV3 and IPV3. The error of concern is the recorded information for IPV3. At the time, the Kenya national immunization programme recommended a single dose of IPV, which was introduced into the national immunization schedule in 2015. Thus, it is unlikely that the child received a third dose of IPV vaccine as recorded on the homemade HBR; rather, it is more likely that the health worker recorded the numeral 3 after IPV out of haste as they wrote a numeral 3 after each of the preceding vaccines. Similarly, in Figure 1, panel E, the health worker has grouped all vaccines, including IPV, administered on 8 September 2016 under a recording header for the third dose. Again, delivery of a third dose of IPV to this child is unlikely in Kenya given the recommended national immunization schedule, however, from the information provided the reader does not know whether this is a recording error or whether the child indeed received a third dose of IPV.

LESSONS LEARNT

When well-designed and appropriately utilized, HBRs are an effective tool to inform service delivery and facilitate caregiver's awareness and understanding about their child's immunization status. Deviations from well organized, structured HBRs can create inefficiencies, perhaps unnecessary re-vaccination, missed opportunities for vaccination [9] or missed opportunities to discuss the benefits and importance of immunization and extend the health worker / caregiver relationship. For example, when a health worker encounters multiple HBRs where layout and recording fields differ across records, recording errors may be more likely to occur and coordination of care may be compromised if she is unable to identify necessary information. The absence of structured areas and language for vaccine names and doses required may impair a caregiver's knowledge of what vaccines their child has or has not received [4]. Legible handwriting may impact the overall effectiveness of any HBR [1]. Because all information—including what would be pre-printed on an official form—is handwritten on these homemade records, the usefulness may be particularly complicated if a health worker's handwriting is illegible, a problem known to be related to medical errors [5]. Also, homemade HBRs on notebook or

loose-leaf paper are often more susceptible to damage than officially issued HBRs which tend to be printed on heavier card stock paper or (less frequently) water-proof, tear-resistant paper products that improve the durability of the document.

The homemade HBRs identified in Kenya, likely used due to HBR stock-outs reported in 2014 and 2015 [2], compromised data integrity and may have resulted in health workers acting on inaccurate information. It is important for immunization programmes to recognize the use of replacement notebooks to record vaccination history — although a reasonable short-term, back-stop solution in the absence of a durable, standardized HBR issued by a health authority — is not a long-term solution. Whenever possible, use of photocopies of the official HBR is preferred to homemade records. Unfortunately, policies on the best course of action in the event of a HBR stock-out are rare, but such guidance is critical for health workers. Careful consideration may be given to development of practical strategies and processes for health workers to re-issue official HBRs when available upon re-supply and to appropriately update those officially-issued HBRs records with information from replacement records. Most importantly, strategies for preventing stock-outs [2,3] in the first place, including the presence of stock monitoring systems and appropriate supply forecasting, are critical.

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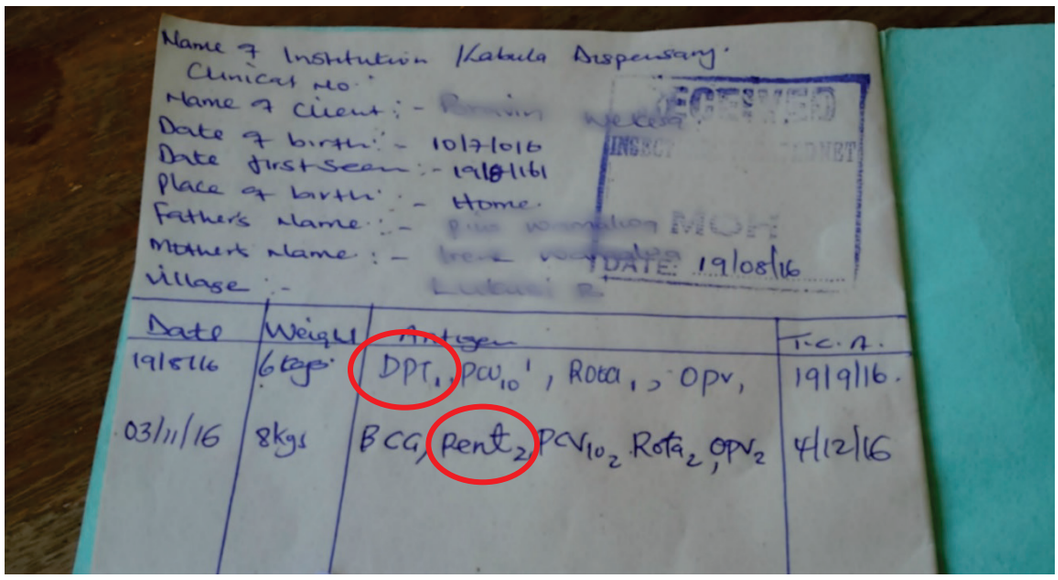
Table 1. Recommended infant vaccines by the Kenya national immunization programme, 2016

(# doses) vaccine	Recommended age
(1) bacille Calmette-Guérin vaccine	birth
(3) pentavalent diphtheria and tetanus toxoid with pertussis (DTP), *Haemophilus influenzae* type b (Hib) and hepatitis B (HepB) vaccine	6, 10, 14 weeks
(birth+3) oral polio vaccine	birth; 6, 10 , 14 weeks
(1) inactivated polio vaccine	14 weeks
(3) pneumococcal conjugate vaccine	6, 10, 14 weeks
(2) rotavirus vaccine	6, 10 weeks
(1) yellow fever virus vaccine	9 months
(2) measles and rubella combination vaccine	9, 18 months

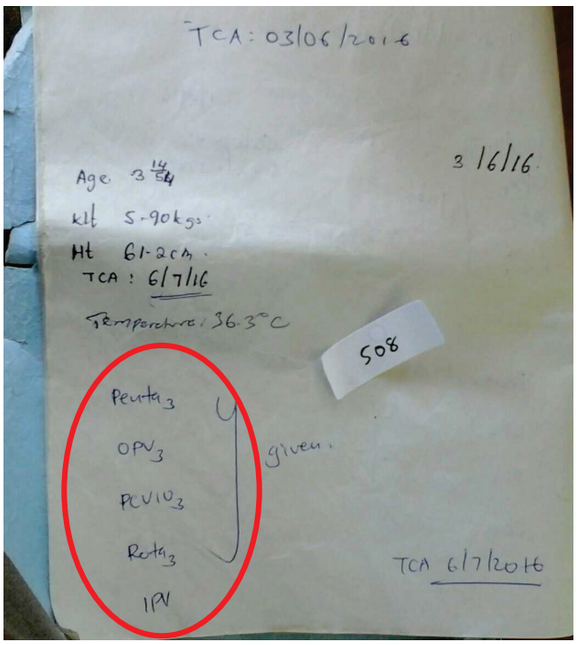
Source: Data reported by the Kenya National Immunizatio Programme to WHO and UNICEF in the Joint Reporting Form on Immunization in April 2017.

Figure 1. Examples of vaccine history recording errors related to absent standard vaccine naming on homemade home-based records

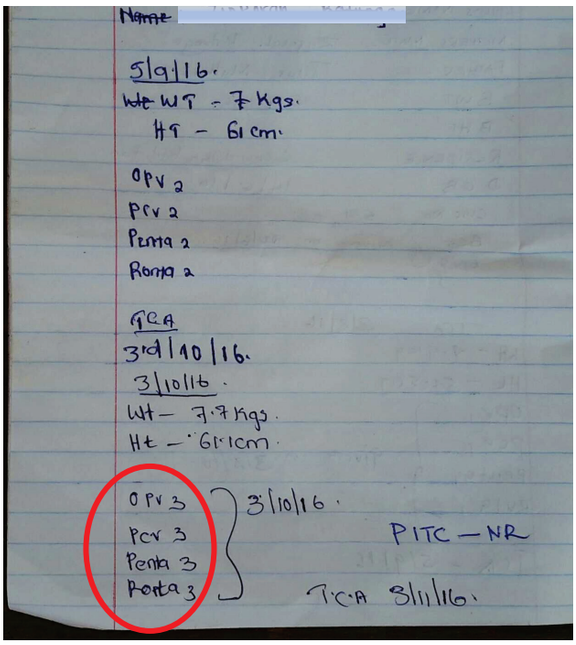
panel A



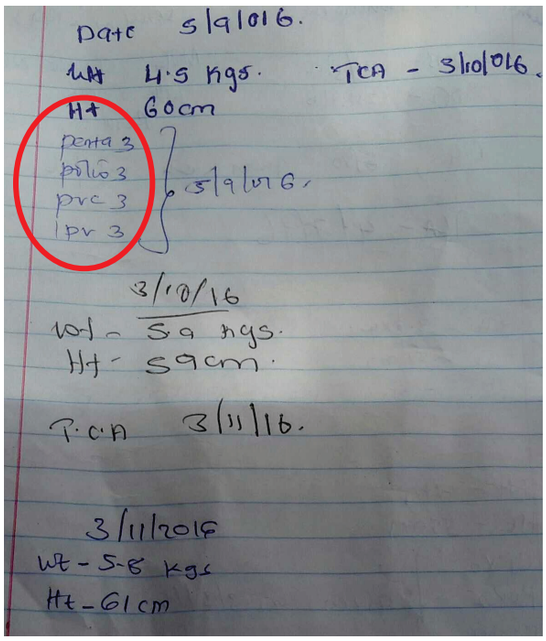
panel B



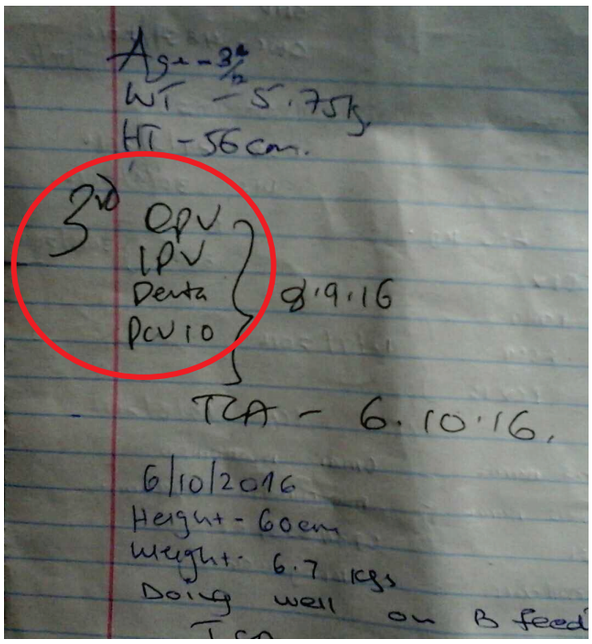
panel C



panel D



panel E



Images source: 2016 Kenya Missed Opportunities for Vaccination (MOV) Assessment, November 2016