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Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

Introduction

A wise man once said 'Many are touting these new technologies as the missing link that can allow poor countries to catch up to their rich country counterparts ... [but] new technologies are not a panacea or silver bullet ... low-tech, simple solutions are available for many development challenges' (Amoko 2002).ⁱ This insight has influenced what follows.

At the outset, let us emphasise that the research described here was a preliminary investigation, intended to identify fruitful avenues for future development. Our two months of research was neither on a scale nor in such a depth as to sustain hard, definitive recommendations suitable for rapid implementation across an entire country.

In designing a health management and information system, the ideal is a system that captures as many data elements as possible as by-products of the management of immediate patient care and thus delivers an optimised range of outputs (including management information at a range of levels, epidemiological data, research data and whole case histories suitable for teaching and learning purposes) from a minimum range of inputs.ⁱⁱ The desirability of such systems has been recognised for a long time. However, delivering them has proved to be a long and laborious process, with many set-backs along the way.ⁱⁱⁱ In developing countries especially poor monitoring and evaluation have been a significant factor.^{iv} The efficacy of health management and information systems is of particular importance in the early stages of epidemics of infectious disease when timely resource mobilisation can play a major role in reducing morbidity and mortality.^v

In Sub-Saharan Africa, health management information systems (HMIS) tend to deliver low-quality, out of date data. In Malawi, as Kasambara et al. have put it 'the country's health sector still lacks accurate, reliable, complete, consistent and timely data' (Kasambara 2017).^{vi} Attempts to address these challenges are sometimes carried out by means of desk research based on 'top-down' approaches.^{vii} The starting point of this research was the proposition that information systems should deliver what front-line health staff need first. Accordingly, the research started at the grass roots with the record keeping behaviours of clinicians, pharmacists, nurses, midwives and other frontline healthcare staff. The research was aligned with the strategic priorities of the Ministry of Health which has recognised that poor data quality is a significant challenge.^{viii}

Medical record keeping systems normally capture the same data elements that are required by health information systems. As Sebina and Grand have expressed it 'data and related information are derived from the records'.^{ix} Frontline members of staff in Malawi and in neighbouring countries devote a good deal of their time to creating or adding to medical records in two formats. Firstly they keep records internal to the clinics, dispensaries and hospitals in which they work.^x Secondly, they make entries in the health passports that over 90% of the population possess. These simple card and paper documents have been described as having the advantage that they provide an integrated record of immunizations, public health interactions, illnesses and attendances at health facilities for each person.^{xi} At present, compiling statistical returns for the District Health Officer constitutes an additional and sometimes unwelcome burden superimposed on the normal medical record keeping duties of frontline personnel.^{xii}

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

The goal of the research was to identify ways in which medical record keeping systems and health information systems might be integrated. The aims include minimising the workload of busy frontline health professionals and radically improving data quality. ~~Specific~~ There were three ~~specific~~ objectives. ~~included:~~ ~~To~~ gather information regarding current medical record keeping practices internal to at least 2 hospitals and all local health facilities in one district; ~~to~~ analyse the data gathered and to contextualise the analysis in relation to the challenges surrounding Health Information Systems; ~~and, to~~ ~~To~~ share the findings of the research.

Methodology

The research was grounded in the theoretical stance that information systems are sociotechnical systems (Alter, 2008).^{xiii} In this context, customers of information systems include the Ministry of Health, anti-corruption agencies, donors, NGOs and a range of other key stakeholders. At an early stage in the project the researchers consulted with senior personnel in the Ministry of Health, Baobab Health Trust, Christian Health Association of Malawi and other key stakeholders. The existence of a multiplicity of stakeholders, including donor agencies, is commonplace in developing countries.^{xiv} Participants in information systems include clinicians, nurses, midwives and pharmacists. Participants work in government and private hospitals, clinics and other health facilities. From the perspective that information systems are sociotechnical systems, patients may be regarded as occupying an intermediate position between customers and participants.

This was a qualitative research project. It was carried out in central hospitals in Blantyre and Zomba and in health facilities of all sizes in Chikwawa District. Chikwawa District lies in the Lower Shire Valley. It has a particularly challenging environment as it experiences very high temperatures in the hot season and is prone to extensive flooding in the rainy season. The primary focus of the research was on real-life custom and practice. The study population consisted of participants in information systems, as defined in the previous paragraph. As is common in qualitative research, the sample was a purposive rather than a statistically representative one. This being the case, the size of the sample was determined primarily in relation to the geographical and institutional settings being studied. Thus, in Chikwawa District with 35 local health facilities the purposive sample consisted of all the lead frontline health staff in those 35 facilities. In practice we were able to conduct interviews in 27 facilities.^{xv} Those facilities at which we were unable to carry out interviews included some health posts that are only open for one day in each month. In addition, one facility had been closed because a bridge nearby had been washed away. Our work in hospitals covered more institutions and yielded more interviews than we had originally committed to – in five hospitals rather than two.^{xvi} The field research was carried out in May and June 2017.

Interviews with a range of participants were undertaken on a face-to-face basis in the settings identified. In local health facilities, the most senior member of the frontline staff (nurse, midwife or medical assistant) was interviewed if he or she was available. Otherwise interviews were conducted with another member of staff. Sometimes a person with particular responsibility for records and data was interviewed separately. In hospitals the focus was on clinicians and on clerical staff, particularly medical records personnel. Questions of sample size and sampling technique which necessarily arise in relation to quantitative research were largely inapplicable here.

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

Interviews were supplemented by observation and the collection of relevant documentation. The existing medical record keeping systems were analysed both in terms of their efficacy in support of immediate patient care and potential value as a source of planning and epidemiological data.

A data collection tool was used in the research (appendix A). The questions posed were intended to open discussion and to provide respondents with an opportunity to state their opinions and reflect on their experience. Where appropriate probing supplementary questions were utilised to encourage respondents to elaborate on their statements. Analysis of the findings from this research was carried out by means of reiterative coding – identifying key terms and concepts used by respondents and defining inter-relationships between these - using the grounded theory approach (Bryman, 2004).^{xvii} The result was a two tier scheme of coding (appendix B).

Ethical research permission was granted by the College of Medicine in the University of Malawi and by the University of Glasgow in the United Kingdom.

IT Challenges

There is a recurrent pattern in the public services in Malawi, namely the excessive use of official IT systems and equipment for personal and recreational purposes (Tough, 2011, Phiri and Tough, 2017).^{xviii} In many public organisations 80% plus of server space is used for storing and accessing films and music downloaded from the internet along with personal videos, family photographs and a good deal more. Sometimes the available bandwidth is almost entirely used to download films and music for recreational use. One result is that official e-mail systems frequently do not work, forcing those public servants who wish to fulfil their duties to resort to free e-mail systems like Yahoo and Hotmail. This situation has to be factored in to any realistic proposals for the improvement of Health Management Information Systems and Medical Record Keeping Systems.

Main results of the study^{xix}

Health passports

Health facility members of staff articulated a range of concerns about health passports. These included the following. Health passports can easily be destroyed or damaged. In addition, many people possess more than one health passport. In some health facilities, patients will be encouraged to buy a new health passport if they attend without their current health passport: they end up with two. There are, however, less haphazard patterns at work. Some patients do not wish it to be known that they are HIV positive or participating in a family planning programme and therefore they opt to have two health passports. This can impact negatively on the health care they receive because a full history is not available when only one of the two health passports is produced at the point of health care delivery. A further complication arises because some people borrow a health passport and impersonate another patient to avoid the charge for a replacement.

Institutional records – registers

Registers are found in every health facility in Malawi. Characteristically they capture some or all of the following data elements: date of attendance; name of patient; gender; patient's address; patient's occupation; test(s) carried out and results obtained; condition and/or diagnosis; treatment; drugs prescribed. The largest number of registers that we saw in use in a single health centre was

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

19. Hospitals and other facilities that provide in-patient treatment necessarily keep registers of admissions and discharges. Where there are laboratories, registers of tests are maintained. Virtually everywhere, pharmacy registers record prescriptions issued.

Some respondents articulated the view that the number of registers in use is excessive. They understand that the range is intended to simplify reporting but argue that it un-necessarily complicates their working lives. In contrast, respondents working in psychiatry expressed the view that mental health problems tend to be under-reported precisely because there are no separate registers for psychiatry in local health facilities.

Entries are made in simple chronological order and normally no name index is compiled. So, if a patient has lost or forgotten their health passport it is difficult to use the registers to find information about their previous attendances.

Institutional records – case records

Case files or record cards are generally found only where in-patient treatment is provided. The card-based systems for patients receiving ART as out-patients are an exception to this pattern. For women giving birth as in-patients at local facilities card-based systems are used also. The most sophisticated and formal case files are to be found in the field of psychiatry, particularly in respect of in-patients. This reflects the requirements imposed by legislation.

Amongst the small rural hospitals and health centres, those that are members of the Christian Health Association of Malawi [CHAM] tend to have the more sophisticated record keeping systems. They are also the facilities that are least likely to neglect the routine tasks associated with implementing the systems. The explanation may be that CHAM institutions charge for their services.

Record keeping matters – data issues

There are three strands to this subject: uncaptured data; data errors; and data loss. Generally, uncaptured data reflects two factors. These are: extreme pressure of work; -and, shortages of staff, especially staff with specialised clerical skills.

Another issue in relation to uncaptured data concerns mental illnesses. Respondents from the field of psychiatry are convinced there is a serious under-reporting of mental health problems. They attribute this to the difficulty that many colleagues experience in using diagnostic terms from the field of psychiatry. This may be reflected in a noticeable pattern that occurred when respondents were asked about the extent that they rely on their memory. A substantial number cited people with mental health problems as the patients they were most likely to remember.

Some data errors may be attributable to staff shortages and workload also. When frontline members of health staff are under acute pressure they make mistakes. The challenge of data errors is further compounded by the lack of adequate and appropriate training for data clerks and other record keeping specialists. It is common for them to be transferred from other duties with insufficient preparation. A further factor is the employment of people who are wholly unsuitable for record keeping and data capture tasks.

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

Damage to and/or complete loss of registers is the simplest explanation for data loss. Registers may be removed from health facilities altogether. Respondents described to us how they had found registers in villages: a resident had decided to take them home to show to neighbours. In parts of the record keeping system that use IT, viruses can result in data being lost, corrupted or rendered inaccessible.

IT issues and utilisation

At present utilisation of IT for health information management and medical record keeping is concentrated in hospitals and especially the five central hospitals where computer-based systems were first introduced in 2001.^{xx} In the Queen Elizabeth Central Hospital the SPINE system was introduced as an integrated database for all medical in-patients (incorporating all of the Ministry of Health standard data elements for registers). Unfortunately key data elements were supposed to be captured into SPINE at the point of discharge rather than during the process of treatment: as a result many junior clinicians failed to perceive any advantage to them from collaborating in the processes of the system. By the time of our research, the SPINE system was experiencing serious challenges and appeared to be on the verge of being abandoned. In contrast, all of the central hospitals have some IT-based stand-alone systems, e.g. for laboratories, pharmacy, Anti-Retroviral Therapy, neonatal care, diabetes and TB. This pattern of provision is strongly suggestive of the influence of donors and underlines the difficulty of sustaining integrated and comprehensive systems.

A range of informants, not least at district level, referred to a previous initiative designed to improve health information management and medical record keeping by introducing IT on a wide scale. This initiative was apparently supported by the Sector Wide Approach (SWAp) in Health at a time when bilateral aid to Malawi was at a high level. It appears from the information we were given that following the Cashgate scandal this initiative ceased to be sustainable. Unfortunately, we have struggled to obtain satisfactory information about the scale of the initiative and its trajectory over time^{xxi}.

Other matters

Several respondents referred to unethical behaviour by health staff. The 'leakage' of drugs from pharmacies was a common cause for concern. Unethical behaviour by patients was reported also. This consists in the main of making false statements to obtain drugs, sometimes for re-sale. Breaches of the confidentiality of sensitivity personal data were mentioned by a range of respondents.

We questioned respondents about the extent of reliance on the memory of health staff and patients. In the smaller health facilities especially, regular clients become familiar to members of staff: treatment may sometimes be given even though the patient has neglected to bring their health passport. Those who are attending ante natal clinics frequently were identified as falling into this category. As mentioned above, patients with mental health problems are often remembered too.

Reliance on the memory of patients was also discussed. Some respondents stated that illiterate patients cannot be relied on to remember previous episodes of care accurately. This seems to be at variance with academic literature that suggests that illiterate people often have better and more

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

accurate recall than those who rely on the written word as an aid to memory (Vansina, 1965, Tough, 2012).^{xxii}

The duplication of information in parallel record keeping systems and the associated increase in the workload of health staff was described by many respondents. An extreme version of this was seen in a hospital where a discharge register is compiled and then three separate registers – one each for three diagnostic categories – are abstracted from the discharge register. Clerical staff resent this kind of activity as a poor use of their time.

Human factors – staff and patients

We spoke to the members of staff in charge of each facility wherever this was possible. In hospitals these were invariably clinicians. In the smaller health facilities they came from a range of backgrounds and included medical assistants, nurses, midwives, health surveillance assistants, medical technicians and in a couple of instances statistical clerks. In some facilities we interviewed staff with special responsibilities for data collection and record keeping separately. It became evident that some of those posted to remote health centres and posts were not happy at being sent there. The negative effect of such postings on their marriage prospects and the absence of mobile phone connections were mentioned as factors. Reference was made to: postings that were regarded as too short; and, excessively frequent transfers between facilities.

Shortages of clerical support staff are common but not universal. Some respondents emphasised that even when clerical support staff are available, there are concerns about their training, accreditation and career progression prospects. Particularly, it was felt that in some of the hospitals the focus is on competence in ICT rather than ICD – the International Classification of Diseases - and that the latter would be of greater benefit.

Analysis

Minimising workload and duplication

Our research has revealed many instances of the duplication of information in parallel record keeping systems, many of them laboriously maintained by hand. It has been made clear by respondents that members of staff are acutely aware of this pattern and resent this kind of activity as a waste of their time.

However, in the short term at least, some duplication may be desirable and necessary because IT systems are often unreliable. As Msiska, Kunitawa and Kumwenda state, hardware and connectivity problems persist even in central hospitals (Msiska, 2017).^{xxiii} Patient databases and other digital systems can be out of use for long periods. Therefore, in some circumstances it may be essential that certain manual systems should continue in parallel to electronic ones, despite the unavoidable duplication of effort that this involves.

Health Passports

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

There are drawbacks to the use of health passports as a critical component of the record keeping system in health care. Crucially, for the great majority of patients no case notes or record cards are kept on the premises by hospitals, health centres and other facilities. As a result there is no means of cross-checking the accuracy of the returns sent to the Ministry of Health from health facilities.

It is not being suggested here that the use of health passports should be abandoned but the challenges outlined above do need to be addressed.

Registers

A considerable amount of effort and staff time goes into compiling registers throughout the health care system. Their information content has the potential to be of value in support of patient care and for local management purposes. However, at present, the registers serve only one purpose – to generate periodic reports. These reports in turn serve primarily to support the production of aggregate statistics at the national level. The failure to make good use of the information contained in registers arises primarily because they lack any effective infrastructure of retrieval. Entries are made in simple chronological order and no index is compiled.

Staff shortages and inappropriate re-deployment

Shortages of clerical support staff are common. As a result members of frontline health care staff have to undertake routine clerical or data capture work, frequently at the expense of their core duties. This kind of scenario is particularly associated with uncaptured data and data errors. At times when there are large numbers of people waiting to be treated medical assistants, nurses and others may decide to omit records creation and data capture altogether so they can carry out their primary functions. Even when members of staff do not omit record keeping entirely, they often make mistakes that result in data errors. In addition, informants described the mobilisation of wholly unsuitable personnel for record keeping and data capture tasks: ward maids, cleaners, security personnel and volunteers from village health committees. It is to the credit of the individuals concerned that they are willing to help: nonetheless their participation is a potent factor in explaining data errors.

Staff training

There is a noticeable lack of adequate and appropriate training for data clerks and other record keeping specialists, especially outside the central hospitals. This in turn leads to an absence of appropriate accreditation and career progression pathways. Above all, these members of staff need a good grounding in diagnostic terminology. As Kasambara et al. have expressed the matter 'improper comprehension of some terms by health surveillance assistants (HSAs) and statistical clerks led to incorrectly recorded data'.^{xxiv} Equipped with a good grounding in diagnostic terminology staff are much more likely to make the necessary entries accurately. Weaknesses in human resource development are not limited to Malawi. Shadrack Katuu has observed significant challenges in South Africa also.^{xxv}

Unethical behaviour

Respondents referred to unethical behaviour by health staff and patients. The 'leakage' of drugs from pharmacies was a common cause for concern. Effective Health Management Information

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

Systems and Medical Record Keeping Systems can, and should, help to detect and deter such behaviours.

Use of ICT

We found some indications of problems that had arisen from a short-lived SWAp (Sector Wide Approach) initiative to introduce ICT on the model of systems used in North America and Western Europe. In a number of health centres databases had been created to hold the data otherwise entered into registers: in none of the district facilities that we visited were these databases still functioning. Informants in local health facilities referred particularly to the provision of mobile telephones through the SWAp. As all of the phones had ceased to work within twelve months, it seems possible that they were being heavily used for purposes in addition to those for which they were provided: by comparison, Malanga reports a 60% breakdown rate amongst mobile phones used in mobile health initiatives across Malawi as a whole.^{xxvi} As mentioned above in the section on human factors, several health care workers told us about the intermittent, unreliable or even non-existent mobile phone coverage in the areas to which they had been posted. They focussed on the consequences of poor mobile phone coverage for their personal lives but the implication is that mobile health initiatives would struggle to make headway in these places. It seems likely that these health care workers in Chikwawa would empathise with Sam's statement – made in relation to Sierra Leone – that 'understanding mobile phone use in healthcare from the perspective of the marginalised is crucial'.^{xxvii}

Conclusions

New approaches that use intermediate and hybrid technologies may have a better prospect of delivering satisfactory, realistic and affordable medium to long-term solutions than strategies predicated on the assumption that only systems that are wholly electronic are worth considering. One option that is worth investigating would be a hybrid system of medical record keeping based primarily on paper and card but with a digital database acting as a spinal column for the system. Ideally, the paper and card components should constitute a system of patient case files, so that health facilities possess internal records and do not have to rely on health passports alone. Records of this nature would enable quality checking of the periodic reports submitted to the Ministry of Health as well as supporting the delivery of immediate patient care and (potentially, at least) the generation of management information at local level. In a system of this nature, the digital database would act as an integrated register holding essential demographic data about patients. It would also enable improved retrieval from the paper and card components of the system and support the compilation of the periodic reports on which the HMIS depends. In the long-term, it would make the existing array of manually compiled registers redundant. That this approach is feasible is demonstrated by its noticeable areas of overlap with the eHealth Strategy adopted by the South African government which is predicated on the creation of a national patient registry and Patient Master Index.^{xxviii}

That a hybrid system can be made to work in Malawi is demonstrated by the experience of the Zomba Mental Hospital which uses just such a system reasonably successfully despite periodic downtime. Nonetheless, new approaches of this nature would need to be designed and tested on a limited scale in a District setting - to demonstrate that they are feasible, affordable and sustainable –

Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

before large scale implementation could take place. And large scale implementation would probably need to be introduced in an incremental fashion.

Fundamentally, for any change to be successful, it is essential that personnel from Malawi's health services – from the most senior officers in the Ministry of Health to the junior ranks in rural health centres – should be engaged at all stages of the process. As donors and NGOs are a major component of the country's health services, their disparate interests will need to be factored in also.

The most important barrier to the adoption of hybrid systems using intermediate technologies is to be found inside the heads of influential people, both in the developing world and in the developed world. It is frequently taken for granted that ICT alone provides the solution to all challenges. Cost and sustainability are acknowledged as challenges but not as a basis for rational reassessment of policies and priorities. For example, the eHealth Maturity Model developed by the Bill and Melinda Gates Foundation has 5 maturity levels.^{xxix} The lowest is paper-based systems whilst the highest is comprehensive and integrated adoption of ICT. Here, progress is defined in terms of a technologically fixated pathway. This teleological mindset is made even more explicit in Roger's Diffusion of Innovation model where those who fail to fall in with contemporary orthodoxies are labelled 'laggards'.^{xxx} It is understandable that the desire to avoid such pejorative labels influences decision-makers. However, as our research demonstrates, there is a rational case for adopting less expensive approaches that employ established low-cost technologies and the plentiful human resources available in Malawi as a partial substitute for costly imports.

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Medical record keeping systems in Malawi: is there a case for hybrid systems and intermediate technologies?

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