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Quality in Practice

Improving inpatient medication adherence using attendant education in a tertiary care hospital in Uganda

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Abstract

Quality problem: Although widely utilized in resource-rich health care systems, the use of quality improvement (QI) techniques is less common in resource-limited environments. Uganda is a resource-limited country in Sub-Saharan Africa that faces many challenges with health care delivery. These challenges include understaffing, inconsistent drug availability and inefficient systems that limit the provision of clinical care.

Initial assessment: Poor adherence to prescribed inpatient medications was identified as a key shortcoming of clinical care on the internal medicine wards of Mulago National Referral Hospital, Kampala, Uganda. Baseline data collection revealed a pre-intervention median inpatient medication adherence rate of 46.5% on the study ward. Deficiencies were also identified in attendant (lay caretaker) education, and prescriber and pharmacy metrics.

Choice of solution: A QI team led by a resident doctor and consisting of a QI nurse, a pharmacist and a ward nurse supervisor used standard QI techniques to address this issue.

Implementation: Plan-Do-Study-Act cycle interventions focused on attendant involvement and education, physician prescription practices and improving pharmacy communication with clinicians and attendants.

Evaluation: Significant improvements were seen with an increase in overall medication adherence from a pre-intervention baseline median of 46.5% to a post-intervention median of 92%. Attendant education proved to be the most effective intervention, though resource and staffing limitations made institutionalization of these changes difficult.

Lessons learned: QI methods may be the way forward for optimizing health care delivery in resource-limited settings like Uganda. Institutionalization of these methods remains a challenge due to shortage of staff and other resource limitations.

Key words: quality improvement, quality management, training/education, human resources, leadership

Quality problem or issue

Health care systems in Africa face multiple challenges, ranging from shortages of both human and non-human resources, to inadequate physical infrastructure for the delivery of health care services [1]. Africa hosts only 4% of the global health workforce yet contributes 25% of the global burden of disease [2, 3]. Uganda faces similar challenges; The Ministry of Health of Uganda identified insufficient human resources, unavailability of, and poor access to medicines as key challenges affecting the nation's health care system [4]. To cope with these challenges, health care workers and patients have to use innovative measures to ensure that the available resources are optimized. One of the innovations that have been adopted by the Ugandan health care system is the use of lay caretakers, also known as attendants, to compensate for inadequate human resources in the inpatient setting. These attendants are usually patients' relatives, and they perform many tasks that are pivotal to the health of the patient while admitted on the ward, irrespective of the patient's age or nature of the diagnosis. Attendants may be responsible for picking up prescribed medications from the pharmacy, giving oral medications to the patients and supplying intravenous medications to the nurses during their ward rounds. They are even responsible for taking some laboratory samples to the laboratories and collecting the respective results. The attendants' involvement in these tasks is not designated by any official guidelines, and as a result there is no regular system in place to ensure that they know what is expected of them as regards patient management. Thus, although the use of attendants is an understandable response to staffing limitations, a reliance on untrained attendants to assist with carrying out treatment plans or otherwise participate in critical aspects of patient care without appropriate guidance in place, likely contributes to the problem of suboptimal patient care in this setting.

Mulago National Referral and Teaching Hospital is one of the two national referral hospitals in Uganda, and the teaching hospital for Makerere University College of Health Sciences. It is a government funded hospital and most available services are free to the patients [4]. Despite being a referral center, human resources remain limited, and untrained patient attendants are routinely involved in day-to-day patient care activities. The Infectious Diseases ward is one of the internal medicine wards in this hospital. It has a bed capacity of ~60, receives an average of 25 patients per day and is currently staffed by 6 nurses, who are responsible for both day and night coverage. The ward accommodates patients whose primary illness is suspected to be an infectious disease, with the biggest burden being contributed by HIV/AIDS and its associated opportunistic infections.

Initial assessment

Through informal multidisciplinary discussions, staff involved in care on the Infectious Diseases ward at Mulago Hospital identified poor adherence to inpatient medications as a particularly problematic feature of patient care. Failure to receive prescribed medications while hospitalized may in turn lead to poor patient outcomes, increased hospital length of stay and high medical costs [5, 6].

Baseline data collection revealed a pre-intervention median medication adherence rate of 46.5%. This pre-intervention data also revealed that a median of 41.5% of attendants were aware of their expected roles while on ward, and 79.5% of charts contained prescription forms. Of the prescriptions made by the doctors, an initial sample showed only 55% were available in the pharmacy. With these challenges in mind, we conducted a quality improvement (QI) project to improve adherence to inpatient medications on the Infectious Diseases Ward at Mulago Hospital.

Choice of solution

The primary outcome measure was the percentage of prescribed drugs taken by the patient. We defined adherence to medication as receipt of medication as ordered by the treating physician in the patient's chart. Process mapping proved effective in analyzing the process of medication administration, and guided the determination of additional measures (Fig. 1).

Principal process measures were the percentage of attendants educated about the treatment plan and dosing schedules of their

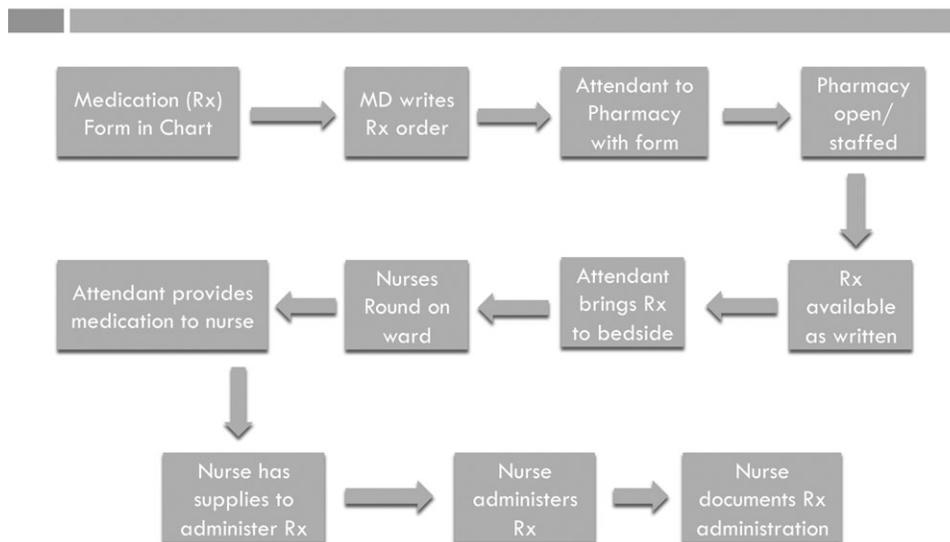## Process Mapping of Inpatient Medication Administration at Mulago Hospital

Figure 1 Process mapping of inpatient medication administration at Mulago National Referral Hospital.

patient, and the percentage of charts with prescription forms. Another measure considered was the percentage of prescribed drugs available in the pharmacy stock; initial data was collected on this measure, but ongoing monitoring could not be done due to practical limitations.

Implementation

Our aim was to achieve a 90% adherence rate to inpatient medications within 3 months for the inpatient population of the infectious diseases ward at Mulago National Referral Hospital.

Baseline data collection began four weeks before the initiation of the project interventions and data collection continued throughout the implementation phase. Thrice a week, the QI nurse reviewed a sample of 30 inpatient charts, randomly selected from the infectious disease ward, to assess the availability of prescription forms and the medication adherence rate. The adherence rate was calculated as the percentage of prescriptions received as written by the physician. The adherence rate was calculated from the day patient was admitted on the ward. The QI nurse and lead doctor intermittently checked with patients to confirm that medication was received as documented in the chart (rather than documented, without actual administration). Twice a week, 20 attendants of inpatients were randomly selected to complete questionnaires on their understanding of their expected roles with regards to patient management. The information collected from the attendants focused on their role in ensuring that the patient received prescribed medications. Data was collected over a total of 17 weeks.

Primary study authors completed training on QI topics via online modules provided by the Institute for Healthcare Improvement's Open School [7], whose methodology is based on Deming and the Model for Improvement [8]. The project had three primary phases. The first phase involved the collection of baseline data; the second phase involved laying a foundation among the hospital staff for using QI processes; the third phase was the performance of Plan-Do-Study-Act (PDSA) cycles. PDSA cycles are an iterative improvement process by which an intervention is conceived (Plan), and applied on a limited scale (Do), after which the results of this application are assessed (Study) and alterations are made to the intervention (Act) for reapplication to the improvement problem in the next PDSA cycle.

After completion of baseline data collection in the first phase, data were made visible to the staff in real time on large run charts posted in the resident's room, nurses' room and on the infectious disease notice board. Data was reviewed fortnightly in a nursing staff meeting that discussed the successes, failures, areas of strength and areas of focus for ongoing improvement activities. During these meetings newly rotating intern and resident physicians on the ward were educated on the ongoing QI project and their roles in relation to QI interventions.

The QI team was led by a resident doctor and consisted of a QI nurse (a nurse whose primary work was QI activities, and who did not have other assigned clinical ward responsibilities), the nurse ward manager of the infectious disease ward, and the ward pharmacist. The QI nurse was hired specifically to support the project. This nurse had no prior experience in QI, but was educated on basic QI topics by the resident doctor, which enabled him to perform required programmatic tasks. His main role in the project was to collect data. Other staff involved in the QI project and its interventions, mostly ward nurses and intern nurses rotating on the ward, also had no prior training or experience with QI. During the course of the project, the QI team leader conducted educational sessions that provided them with basic QI concepts, an overview of the project, its background and aims, and their expected roles.

PDSA cycles

Attendant education

Process mapping and other early investigations showed that lack of attendant understanding of their role in patient treatment was a primary obstacle, making attendant education a potentially high-yield
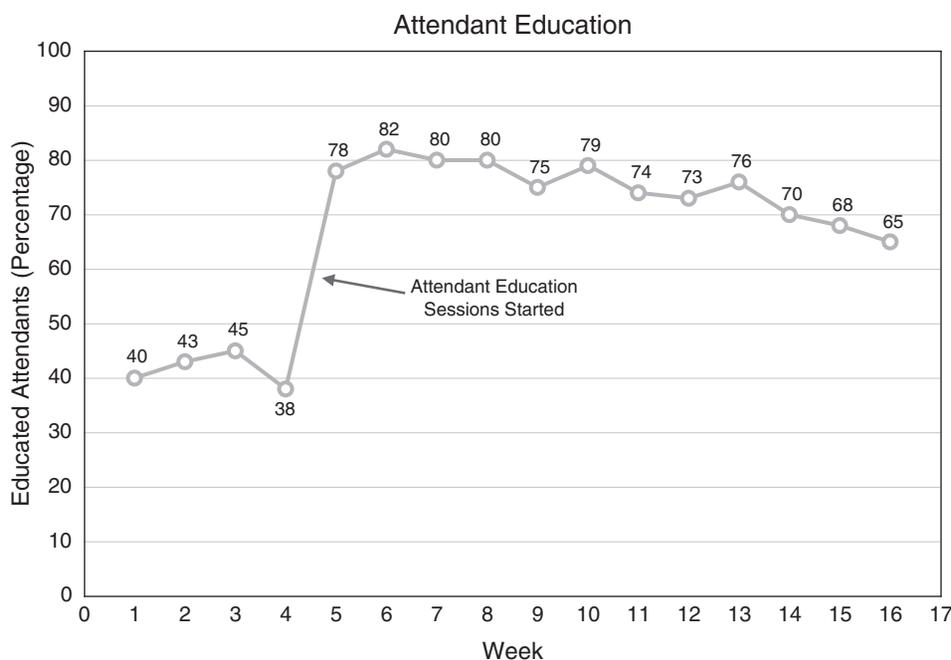

Figure 2 Percentage of attendants educated in the course of the project. Percentages were calculated as medians. Median data were collected from 4 weeks before intervention.

intervention. As such, the initial intervention involved one of the day nurses on duty collecting the attendants in the foyer on the ward every morning and clearly outlining what was expected of them. This was, however, not sustainable throughout the project, as we noticed that it was challenging to gather the attendants all in one place on time. Furthermore there were spacing challenges, as the foyer was often occupied by the overflow of admitted patients. This interfered with the nurse's other duties. During subsequent PDSA cycles, attendant education was performed by the nurse on duty or an available intern nurse as he or she moved through the ward, speaking to the attendants in their ward area. This was felt to be more effective and less time consuming, and thus was adopted for the rest of the project. Daily sessions, rather than more infrequent sessions, were attempted throughout the project due to high patient and attendant turnover. Educational posters and flyers were also placed on the ward outlining the expected role of attendants in patient care for optimal outcomes (Fig. 2).

Prescription forms

While all treating physicians on the infectious disease ward (primarily interns and resident physicians receiving internal medicine training) were in the habit of writing medication recommendations in their daily notes, separate prescription order forms were not always completed, which made it difficult for attendants to obtain needed medications from the pharmacy. When a separate prescription form was not present in the chart, the pharmacist was required to extract the prescriptions from the doctor's notes, and at times this was a prohibitively time consuming process. As a result, the medications prescribed by the doctor would often times not be received by the attendant simply because the prescription was difficult to locate in the chart. To address this issue, physicians were educated by the QI team leader about the importance of placing separate prescription forms in patient charts as they began rotations on the ward. Steps were also taken to ensure that the needed forms were always

available on the ward to be placed in patient charts before and during rounds, as they were previously kept in a locked store, and were inaccessible to rounding physicians. Physicians were also encouraged to make an effort to consistently write clear, legible prescriptions (Fig. 3).

Working with pharmacy

It was noted that one of the causes of the suboptimal adherence to prescribed medications was poor communication between the attendants and the pharmacist, as well as between the pharmacist and the prescribers. Multidisciplinary discussions revealed that pharmacists often dispensed prescriptions to cover only a day or two, even if the prescription written by the doctor was for a longer period. The attendants, however, often believed that they had received the entire supply as prescribed. As a result, attendants did not return to the pharmacy to obtain the remaining medication when the initial supply ran out. This contributed to poor medication adherence. Pharmacy staff was encouraged to communicate with the attendants the dispensed doses and when they were expected to return for refills. Providers were also asked to tell the attendants how many medications they had prescribed, so that the attendants would be aware of how many medications they were expected to collect for their patients. We also noted that prescribing physicians were often unaware of what medications were available in the ward pharmacy, and often did not receive feedback if prescribed medications were unavailable. As such, work was done to improve pharmacy to prescriber communication and prescriber education on pharmacy related issues. In addition to pharmacist and provider education on communication, the pharmacy was asked to post a twice weekly stock list of the available drugs, thus allowing treating doctors to prescribe drugs that were currently available in the pharmacy. While helpful, the effect of this intervention was less than anticipated. The stocking levels for the ward pharmacy varied widely on a daily
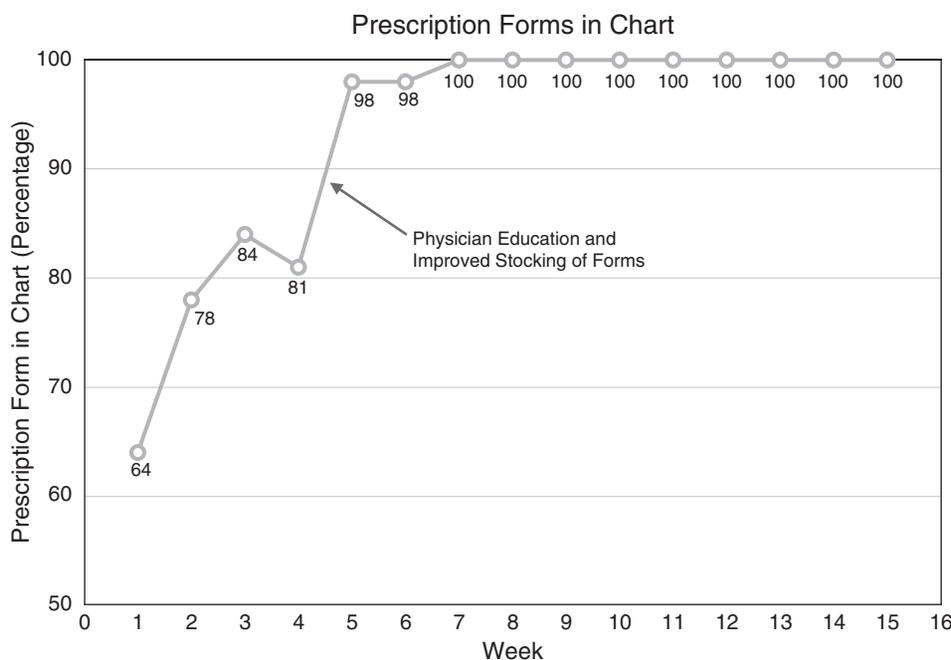
Figure 3 Median Percentages of prescription forms in charts. The most significant improvement was observed following the intervention of educating physicians and facilitating easier access to the prescription forms on the wards.
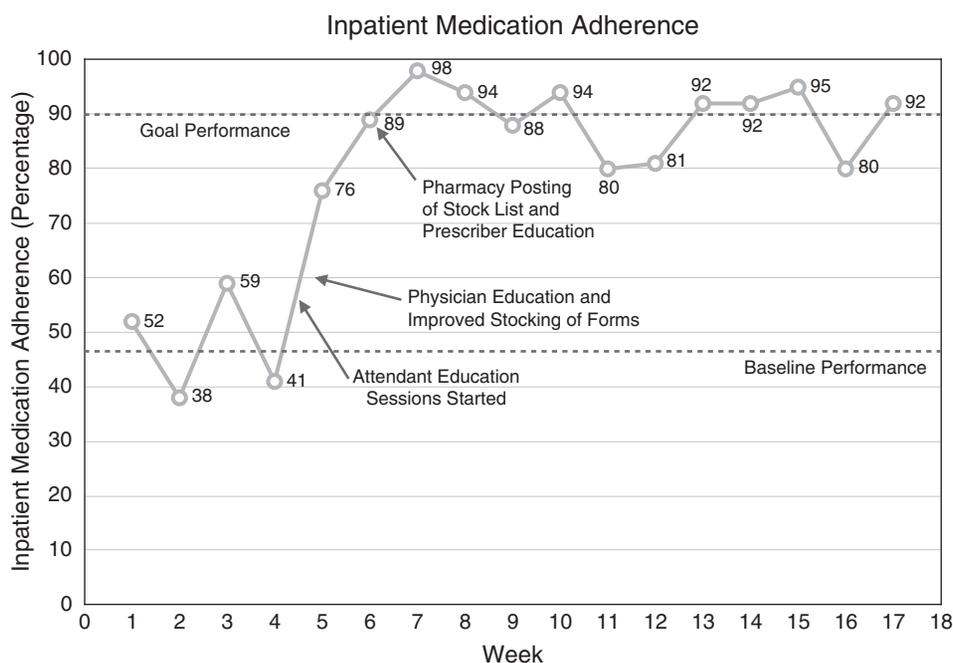
Inpatient Medication Adherence

Figure 4 Percentage of medication adherence monitored. Median baseline was calculated from 4 weeks before intervention.

basis. As a result, even the stock lists posted every few days were accurate only briefly.

Evaluation

Project interventions resulted in improvement in adherence to prescribed inpatient medications from a pre-intervention baseline median of 46.5% to a peak of 98%. This high adherence rate was not sustained, however, with subsequent adherence rates measured from 80 to 95%. The post-intervention median was 92%, slightly above the goal adherence rate of 90%, though with significant week to week variation (Fig. 4).

Lessons learned

The use of standard QI techniques to address the problem of poor inpatient medication adherence at Mulago Hospital led to impressive improvements in medication adherence on the infectious disease ward, though the project goal of a 90% adherence rate was difficult to sustain. While both prescriber education and pharmacy-based interventions appeared useful for improving medication adherence, attendant education appeared to have the most significant effect on the adherence rate.

Although attendant education proved to be the most effective intervention for improving medication adherence on the ward, institutionalization of these interventions was limited by perennial staffing shortages, the improvement of which were outside the scope and resources of this project. Initial gains in attendant education were likely due, at least in part, to the commitment of the nursing staff to the project, and the addition of patient education activities to their already full daily workload in a way that was not ultimately sustainable. The subsequent slow downtrend evident in the rates of attendant education levels during the latter portion of the project likely reflects this inability to continue education activities to the same degree. Alternative education models were considered, and one

novel idea was to enlist the kitchen staff responsible for serving the morning meal to the patients through the attendants every morning. Although non-clinical, these staff members have the most reliable interaction with attendants on a daily basis, and if able to provide basic education during mealtime, they would relieve the already understaffed nurses of this duty. Education of kitchen staff for these purposes would require resources, however, as would the necessary monitoring to ensure the quality of their teaching. Unfortunately, this intervention could not be undertaken during the timeframe of this project.

A number of other novel interventions were considered as well, such as color coding of patient charts to represent different dosing schedules for easy identification by nurses, and provision of alarm clocks to nurses to remind them of scheduled medication administration. Neither of these concepts were ultimately pursued, however, as they were seen as overly complicated given available resources or unlikely to be accepted by nursing staff. Such interventions might be considered during future QI projects or PDSA cycles.

Balancing measures (i.e. measures meant to detect the possible negative effects of a QI intervention) were not quantitatively monitored, which is an area for improvement in future projects. Nonetheless there was little concern for significant harm as a result of project interventions. Regular feedback from nurses in a multidisciplinary setting allowed for alteration of attendant education interventions when they appeared to be impacting other workflow. Qualitative observation of routine physician and pharmacist ward activities, as well as feedback during multidisciplinary sessions did not indicate any other unforeseen effects of project interventions.

Finally, although this project emphasized the use of interventions requiring relatively minimal resources, such as modest staff training and simple attendant education, the improvements that were achieved still required the input of both human and monetary resources in what remains a resource-limited hospital setting. The project itself was supported by grant funding, which provided modest salary support for the QI team leader, as well as the QI nurse, whose activities were key

to project success. While conditions may vary in other environments, the competing requirements of ward nurses and resident physicians at Mulago Hospital (including the requirement whereby resident physicians must pay tuition while training) did not permit a significant time commitment to QI activities without some monetary support. As such, even in light of the initial success of this project, institutionalization of QI-related systemic changes may be challenging in Mulago and similar resource-limited settings.

Sustaining improvement, including organizational acceptance of improvement goals and activities, sustained monitoring of outcomes, and institutionalization of behavior change, present unique challenges in resource-limited environments, although rich literature exists to support these efforts [9]. Despite these challenges, the application of standard QI approaches and techniques in resource-limited health systems is likely to be a high-yield approach to improving systems of patient care. Though these projects require relatively few resources to perform, their success will still require institutional commitment to the support of QI activities and QI practitioners, such as training of staff on QI methods and the ongoing support of QI teams within the hospital. While improvements attained through QI interventions will not eliminate the many difficulties of providing patient care in resource-limited environments, they can help to ensure that patients are being given the best care possible with the available resources.

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