Efficient Patient Care Using E-Health through Automated Patient Management Workflows

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Abstract

In today's world, efficiency of operation is the key discriminator in any industry. Efficiency is not only to contain cost, but also to provide better service to the customer. The same pressure is also visible on healthcare industry, where automated processes are being introduced to increase efficiency of operation. Manual processes for managing a patient right from the moment he presents himself to his doctor till the point of recovery have now become more or less stabilized. However, due to the over-dependence on paper based management of this process, serious lacunas exist. Automating the same through the use of electronic patient management system would definitely increase efficiency by removing the necessity of having a paper based file being moved around thereby reducing the time delays occurring due to the same. The automation of this type of process requires a number of decision support system implemented inside the process. One of the effective methods to do so is through the use of Workflows. Workflows typically employ a combination of cases, work items and resources. A case is a specific situation in which the workflow system is applied. A work item is a task to be performed in relation to this case. Resources are the persons and facilities needed to execute given work items. A pilot project is currently being developed for a limited trial to ascertain the actual benefits over and above the time factor mentioned above. This case study would attempt to demonstrate how the automation of an established process can be made and attempt to postulate the various possible benefits by using the same. This paper presents the outlines of the framework used in the case study. The paper also describes how the flexibility of operation is implemented into the workflow so that it can be modified easily to accept any changed situation in a healthcare environment.

1 Introduction

A healthcare organization is a service-oriented organization and is essentially no different in its characteristics from other similar organization. It has no inventory, depends on consumer satisfaction and needs to maintain tight fiscal control. The area where it differs significantly is that its consumers have little to no say in what they will eventually receive as it is determined by a group of highly skilled professional. There is also another aspect that contains ominous portends within it – the lack of well-defined processes and standards, especially in the clinical side, that are shared industry-wide. It is noteworthy though that this has already begun to change as the various care providers have begun to realize the importance and advantages of possessing these virtues. Administrative workflows have already been standardized except for minor deviations and shared across the industry. But, for clinical workflows, the situation is different. Clinicians widely vary in their approach and management methodologies for the same problems. Although a number of organizations having the wherewithal to formulate and enforce standardized workflows, like the NHS of UK, the processes have been fraught with several pitfalls, the most dangerous of which happen to be the loss of life of the patient, a risk that no well-meaning care provider is prepared to accept for obvious reasons. Developing a clinical workflow (commonly known as clinical protocols when they are formalized with the purpose of enforcing it or clinical guidelines when they are formalized as a series of suggestive steps for the treating clinician) takes anywhere between two months to two years. They also suffer from a serious deficiency in their requirement for continuous evaluation and validation.

2 Governance in E-Health

Governance in healthcare is being practiced ever since Government administered it in public domain. Being *'for the people, by the people and of the people'*, it became necessary for the Government to be answerable to the citizens who elected them. The pressures of reducing operational cost and improving efficiency has forced organizations to be managed in an efficient manner to ensure increased productivity and streamlined business

process flow. In order to ensure proper governance, it is imperative to follow a sequential step of events. These steps are formulation, implementation, monitoring, evaluation and refinement of processes. Where no process exists, no governance can be carried out. To formulate a process, it is necessary for all the stakeholders to sit and debate the various issues and aspects of it. However, formulating a process, albeit an odious task, is not an end it itself. It needs to be implemented and complied with. It is imperative to find out who all are following the process and who all are not along with the reasons for the same. It is equally important to gather as much information as is possible about the process itself. To ascertain whether it meets its intended targets or not, the results should be analyzed and then all necessary corrective measures need to be debated and implemented as a step of refinement of the process.

All these steps of managing a process are cyclic in nature as shown in figure 1. To ensure that the process does not become static and eventually extinct, it is necessary to continue the refinement of the process to formulate it in an effective way. It is most important to ensure that the process remains dynamic and undergoes periodic rejuvenation. One revolution of the cycle ensures increased efficiency at a much less time.

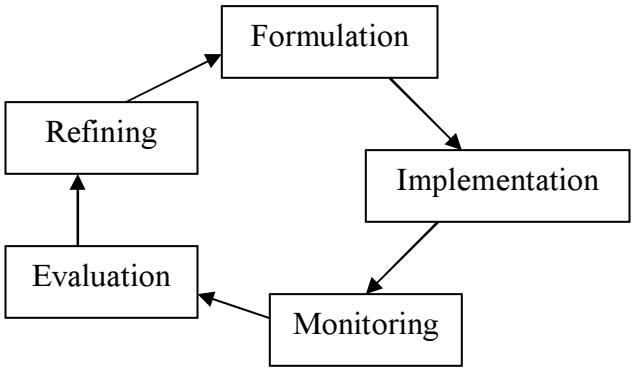

Figure 1. Steps to be followed to manage a process

As of today, IT enablement of process does not add much value other than the secretarial aspect of w*ord processing, doing calculation, creating high-impact presentation, storing important information, and video conferencing.* As standard and well accepted solutions exist in these areas, it makes no sense to re-invent the wheel and make a customized solution that does the same thing. Hence, it is time to make a quantum jump to make us ready for the next step i.e. to deliver efficiency. This is possible if the process is refined constantly and implemented subsequently. The concepts of workflow come handy in managing this cycle of process management. In future, all the new processes will be developed *ab initio* using IT enabled solutions.

3 Basics of Workflow

The workflow process is traditionally defined in office terms as moving the paper, processing the order, issuing the invoice etc. Workflow can be a sequential progression of work activities or a complex set of processes each taking place concurrently, eventually impacting each other according to a set of rules, routes and roles. It is being done for a long time manually. In present days, a number of process-modeling techniques are available to define the detailed routing and processing requirements of a typical workflow. A lot of work has been carried out to automate this workflow so that the efficiency can be increased enormously. In the last 15 years or so we have developed tools to not only do the work, but to manage the workflow. More than just procedural documents, that workflow process is defined formally in the workflow computer system. A computer program manages the process that assigns the work, passes it on, and tracks its progress.

The prime advantages of using an automated workflow management system are following:

1. Errors and mismanagement becomes a rarity as the work done doesn't get any opportunity to get misplaced or stalled.
2. Instead of routine assignment of tasks, the managers can focus on such issues as individual performance, optimal procedures and exceptional cases.
3. The requirement of maintaining a posse of clerical staff to deliver and track ceases.
4. The process to be followed are formalized, documented and adhered to exactly, ensuring that the work is performed in the exact manner as has been planned to meet all businesses and regulatory requirements.
5. The cases are prioritized and assigned to the best system (machine or person) who can carry it out most efficiently.
6. Users can channelize their resources to those areas that require such attention most.
7. Running automated parallel processes are more useful than running traditional single manual ones.
8. By allowing the users to prioritize and perform the 'write' tasks, a 'comfort' environment is created for them to work in.
9. Coupled with lowering of costs and increase in customer service quality, workflows allow a 'feel good factor' to percolate through for the betterment of the company, customers and its users.
10. Workflow systems, routinely, maintain a date and time stamped audit trail where the details of which users did what and when are captured. Such audit

trail allows any authorized persons to have a higher degree of control over the process.

11. Automated workflows, through their reporting and analysis, allow for faster assessment of productivity at various level of the organization. This acts as an early warning system for impending problems and allows for proactive measures to be initiated not only to nip the problem in the bud but also to stop the problem from occurring in the first place.
12. In real time, managers can monitor the staff requirements, make adjustments to assignments in order to meet deadline and generally manage their teams.
13. Through rule based automated alerts, the necessity of having a person or a group thereof to produce a manual warning system that is error free, is totally obviated and 'gut feelings' get replaced by actual facts. This also adds value as an improved monitoring process for the work done.

4 Financial Benefit of Workflow Management System

Workflow Management System benefits can be categorized in the following manner:

- Readily measurable and recognizable savings of direct cost.
- The difficult-to-measure hidden savings.
- Un-quantifiable benefit valuation in the form of intangibles.

4.1 Savings of Direct Costs

These are readily measurable and recognizable. These often involve better utilization and 'right-sizing' of staff. The savings accrue through the measure of time involved in sorting and delivering, assignments of tasks to individuals, that are taken to complete the entire work process. Training time is less vis-à-vis training for manual system with the added benefit of error-free environment. Through automated systems, the work is always 'available' instead of getting lost in a mountain of paper or due to pressure of time management forcing postponement of the work till such time when it is forgotten to be completed. Accidental discarding or sending to the wrong place is reduced and even when these happen due to human errors, such errors may easily be 'discovered' and measures taken to prevent them from happening in future. Through reduction in the requirement of support staff, costs are reduced when automated systems are used. No matter how substantial the cost savings are though, they are inadequate in covering the system cost.

4.2 Savings that are hidden

These are actual cash savings, which in most cases are difficult to measure. Examples are improved work control, time saved by the manager, professional staff productivity improvement and process improvement opportunity like using six-sigma methodology.

4.3 Intangible Benefit Evaluation

These are essentially un-quantifiable are recognizable, although less easily. Such intangibles like improved service, increased employee satisfaction, ensuring privacy and security and elevated organizational options to perform a particular task or a set thereof go a very long way in adding value not only to the organization bottom-line, but more importantly to its top-line.

5 Automated Patient Management Workflows – A Case

In view of the complications associated with clinical workflows, it was decided that only such workflows that have dependency more on the administrative rather than on the clinical component will be considered. This means that decisions based upon clinical findings are not taken into account and no special clinical data capture forms are presented as a direct result of an entry of a particular clinical finding/observation. However, to allow ample flexibility to the clinicians, the possibilities for the user to follow a different flow is introduced so that the user can deviate from the process and enter data as he desires. Thus, if a particular clinician wanted to order an investigational test or capture clinical information over or in place of a suggested test, he is allowed to perform that task.

After careful consideration it was decided that in the first phase the antenatal checkup and well-baby clinic be automated using a custom-built system. The reasons for this were several. The principal reason was to allow the system to perform over a considerable period of time, so that the system's all round performance may be gauged. Typically a period of around twenty-seven months from the moment the mother stopped having her periods due to pregnancy till the baby had its last major immunization dose at eighteen months age is considered for this case. Since a number of users are expected to interact with the system, a host of performance-related data is collected. The biggest breakthrough was to achieve the broad agreement amongst obstetricians regarding managing routine antenatal mothers-to-be, and amongst the pediatricians regarding the development milestones and immunization schedules, thereby making creation of a workflow for each of the groups a much simpler exercise. It was understood that exceptions must and do remain and should be considered as a part of each of the processes, for managing complications or gross deviations like delayed milestones. In order to handle these situations efficiently, for each visit, the clinician has the option to choose the alternate pathway. However,

all such actions are recorded with date and time stamps so as to allow the health analysts to "discover facts" regarding routine visits, both for antenatal as well as well-baby clinic visits, during evaluation of system performance.

5.1 System Requirements

The requirements of the system were following:

Web-based system that uses SSL technology with 128-bit encryption using MD5 to ensure data security. All users are given the IP address of the web-site to log on to

Apache web server using PHP scripting language and MySQL as RDBMS running on Linux servers at the back-end; front-end was a Mozilla 1.5 or above or Netscape 7.0 or IE 5.5 or above free web-browser. All of this was done to bring down the costs

Role-based access – the user had a unique identifier and password assigned. The user's role was also clearly laid out allowing access only to permitted sections of the system

The user of the system was defined as follows:

Consultant Obstetrician – This type of user should have the ability to view, make, reschedule and cancel antenatal appointments; add, edit and view current antenatal clinical records and the various information contained therein; view past antenatal clinical records and the various information contained therein; correspond with patients, nurses, consultants (laboratory and imaging); set, receive and cancel clinical alerts and warnings

Consultant Pediatrician – This type of user should have the ability to view, make, reschedule and cancel well-baby clinic appointments; add, edit and view well-baby clinic and associated mother's antenatal (both current and past) records and the various information contained therein; correspond with patients, nurses, consultants (laboratory and imaging); set, receive and cancel clinical alerts and warnings

Nurse – This type of user should have the ability to view, make, reschedule and cancel appointments; view clinical records; add, edit and view nursing records and the various information contained therein; receive alerts and warnings

Laboratory Technician – This type of user should have the ability to add, edit and view laboratory sample received, rejected, and tested; report the results; receive alerts and warnings

Laboratory Consultant – This type of user should have the ability to add, edit and view laboratory sample received, rejected, and tested; report the results and authenticate it; view associated clinical report; correspond with clinician; set, receive and cancel laboratory value-associated alerts and warnings

Ultrasound Consultant – This type of user should have the ability to view, reschedule and cancel ultrasound appointments; report the results and authenticate it; view associated clinical report; correspond with clinician

Mothers-to-be – This type of user should have the ability to view, make, cancel, reschedule their own antenatal clinic and investigations (laboratory and ultrasound) visits; receive appointment-related information (due, past, confirmation, non-attendance) and health-related information (next steps); correspond with attending clinician

Mothers – This type of user should have the ability to view, make, cancel, reschedule the well-baby clinic and immunizations visits; receive appointment-related information (due, past, confirmation, non-attendance) and health-related information (next steps); correspond with attending clinician

5.2 System Design

The prime consideration during the design of the workflow was to provide utmost protection of the confidentiality of the patient information. Clinical data during labor, post-natal and post-birth stages are captured as free-form text at the point of operation by the clinician. All clinical data and the part of data records that can identify the patient was stored using data encryption. The information is categorized according to the specific stage of the patient. PKI based security measures were taken for the web-enabled screens where the user can access data through Internet. Appropriate fail-over checks and system restoration measurers have been put in place to handle associated risks of a web-based automated system

Another challenge of a web-based system is the data accuracy. All user pages, except the ones that the patient visits, are auto-refreshed every minute to display the latest information available on the server.

All clinic visit appointment dates are generated on the first visit and every subsequent appointment is made as soon as the patient reports at the reception and before seen by the consultant. The appointment dates can be changed as and when necessary. Automated email alerts are sent to the patients regarding their pending appointments.

Patients can view their own and baby's medical records, reports, advice and appointment schedule that displays all pending, attended, and missed appointments.

Every order for an investigation or immunization or medication or request for consultation is forwarded

through to the appropriate user using the accepted workflow.

5.3 Automated Patient Management Workflows

Two main workflows are considered for this case. They are **Ante Natal Clinic (ANC)** and **Well Baby Clinic (WBC)**. To create these two workflows we need to create some sub-workflows, which will be used by these workflows. Three sub-workflows are also discussed in this case. These sub-workflows are '*Laboratory Test', 'Ultrasound', 'Immunization'* and *'Medication'.*

Laboratory Test Sub-workflow:

For a laboratory test ordered by a clinician, once ordered, it is posted on the nursing record for the nurse to take the necessary next steps like verifying the order. The nurse verifies the order by clicking a check box next to the order. The system then posts the order on the laboratory technician's "to do" list. Once the sample has been satisfactorily collected, the technician clicks a check box next to the "sample satisfactorily collected" statement. Once the sample has been tested, the technician clicks a check box next to the "sample satisfactorily tested" statement. If the sample has not been satisfactorily tested due to any reason, he clicks a check box next to the "sample test failed" statement. Such failures will automatically cause the system to post a message on the nursing record so that a new sample may be taken. The system does not make any assumptions regarding who actually takes the sample as it may be the nurse or the technician who does this and the business rule governing this is based on the principle "the one who is available at that time". The nursing record will also show a status against the investigation order that will change at each stage as the technician checks the appropriate boxes. This is akin to the "work-in-progress" statements. Once the tested sample has been reported, the technician will click on a check box next to the "reported by technician" statement. This will cause the nursing record to show that the results are available, and also cause a note to appear on the laboratory consultant's "to do" list asking him to authenticate it. Once he does this by clicking the designated check box for this, the report is published for reading. The nursing record shows "reported by consultant" as the status against the order. The clinician's record displays the same status. Till this point, "test result awaited" was the status. This report is available and can be viewed by clicking on the check box "read report". Once the report has been opened and then subsequently closed by the clinician, he must choose between the messages "Release for reading by all", "Restrict patient access pending further evaluation", or "Re-order for re-confirmation". While the first would allow anyone with authority (patient, nurse, clinician) to read the report, the second would not allow the patient any access, while the third will re-order the test when the system will treat this exactly as a new order for the same investigation.

The block diagram of this sub-workflow is shown in figure 2.

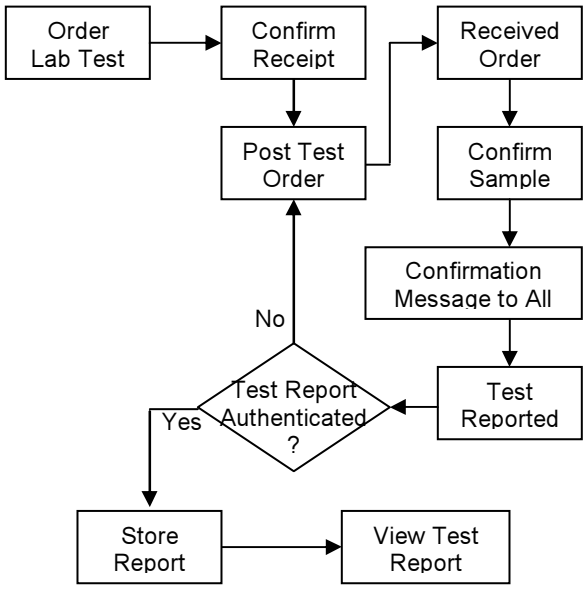

Figure 2. 'Laboratory Test' Sub-Workflow

Ultrasound Sub-workflow:

For an ultrasound test ordered by a clinician, once ordered, it is posted on the nursing record for the nurse to take follow-up action. The nurse verifies the order by clicking a check box next to the order. An appointment is required for an ultrasound, and this must suit the patient and an appropriate open time slot needs to be available. The nurse normally does this in consultation with the patient. However, the ultrasonologist can also do this. This feature is required since in cases where the ultrasonologist is satisfied that he cannot perform the test for any reason and needs to reschedule the appointment, he should be able to do this without the necessity of him having to send the patient back to the nurse for a fresh appointment. The patient may however still be sent back to the nurse for the same without any prejudice assumed by the system. The system then posts the order on the ultrasonologist's "to do" list. Once the patient has undergone the test, the ultrasonologist clicks a check box next to the "ultrasound satisfactorily completed" statement. If the ultrasound has not been satisfactorily carried due to any reason like empty bladder, he clicks a check box next to the "ultrasound test incomplete" statement. Such failures will automatically cause the system to post a message on the nursing record so that

the patient may be resent for the test. Once the ultrasound has been reported, the ultrasonologist will click on a check box next to the "reported by ultrasonologist" statement. Since the ultrasonologist is himself the consultant, his report is taken to be automatically authenticated *de facto*. The nursing record shows "reported by ultrasonologist" as the status against the order. The clinician's record displays the same status. Till this point, "ultrasound result awaited" was the status. This report is available and can be viewed by clicking on the check box "read report". Once the report has been opened and then subsequently closed by the clinician, he must choose between the messages "Release for reading by all", "Restrict patient access pending further evaluation", or "Re-order for re-confirmation". While the first would allow anyone with authority (patient, nurse, clinician) to read the report, the second would not allow the patient any access, while the third will re-order the test when the system will treat this exactly as a new order for the same investigation. The block diagram of the 'Ultrasound' sub-workflow is shown in figure 3.

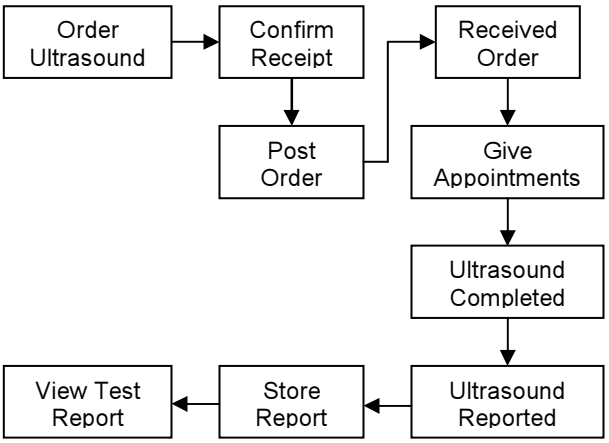

Figure 3. 'Ultrasound' Sub-Workflow

Immunization Sub-workflow:

For all immunization orders, the clinician will review the immunization schedule, name, dose and then click on a check box next to the statement "Administer this immunization". This will cause an appropriate note to appear on the nursing record for the nurse on duty to attend to. Once she has done or not, she needs to respond by clicking a check box next to either "Immunization <dose> of <name> administered" or "Immunization of <name> not administered". Should the latter statement be checked a dialogue area opens up where she needs to click on the appropriate reason for non-administration which are "Patient refused", "Insufficient dose available in stock", and "Unable to administer". The checked statement will be reflected on the clinician's record. The block diagram of the 'Immunization' sub-workflow is shown in figure 4.

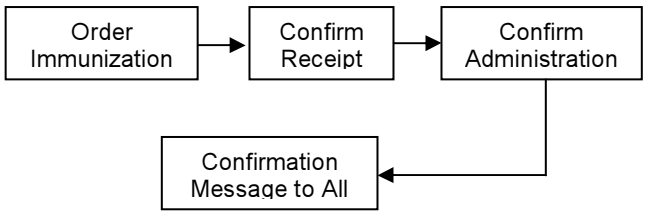

Figure 4. 'Immunization' Sub-Workflow

Medication Sub-workflow:

For all medication orders, the clinician will order the medication by its name, dose and length of administration and then click on a check box next to the statement "Dispense this medication". This will cause an appropriate note to appear on the nursing record for the nurse on duty to attend to. Once she has done or not, she needs to respond by clicking a check box next to either "Medication <dose> of <name> dispensed" or "Immunization of <name> not dispensed". Should the latter statement be checked a dialogue area opens up where she needs to click on the appropriate reason for non-administration which are "Patient refused", and "Insufficient dose available in stock". The checked statement will be reflected on the clinician's record. The block diagram of the 'Medication' sub-workflow is shown in figure 5.

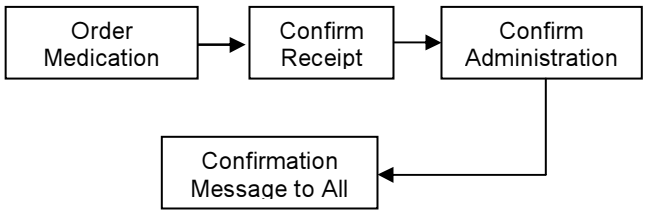

Figure 5. 'Medication' Sub-Workflow

Ante Natal Clinic Workflow:

A lady in her child-bearing age (someone who has had her menarche and yet to have her menopause) misses her periods and visits the clinic with a suspicion of pregnancy. She is then taken through several well-defined steps to conclude whether she indeed is pregnant or not. Once her pregnancy status is established, she requires visiting the antenatal clinic on a periodic basis to ensure that her pregnancy is progressing satisfactorily. She undergoes several laboratory and ultrasound investigations and receives several immunization doses at specified periods. The visits vary from once a month at the initial stages to once a week.

The block diagram of Ante Natal Clinic workflow is shown in figure 6.

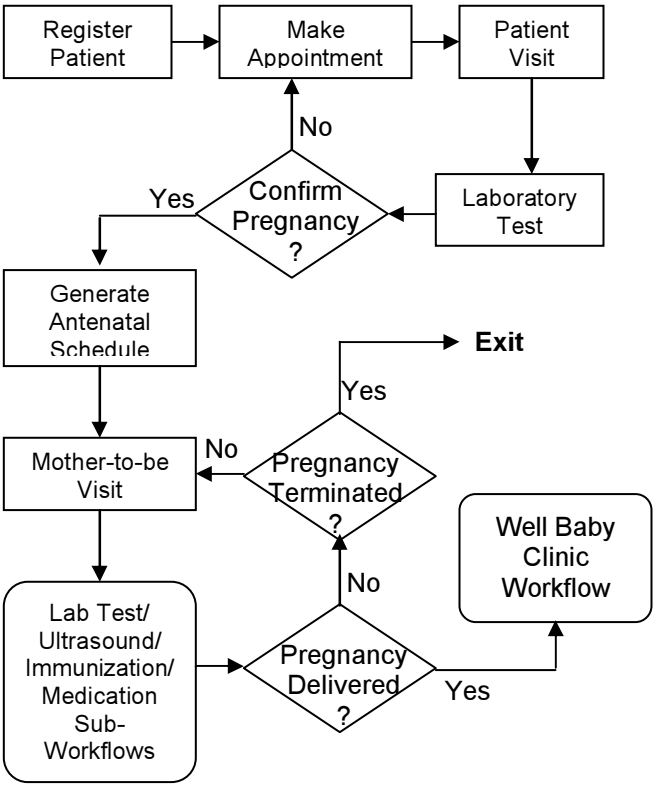

Figure 6. 'Ante Natal Clinic' Workflow

Well Baby Clinic Workflow:

Once the baby is delivered, received the first immunizations that are due before discharge to home, and been discharged to home with mother, the well-baby workflow is followed to monitor its progress through the first eighteen months of its life. The visit to the clinic vary from once-a-month during the first six months, then once-every-three months till the baby is eighteen months old.

The block diagram of Well Baby Clinic workflow is shown in figure 7.

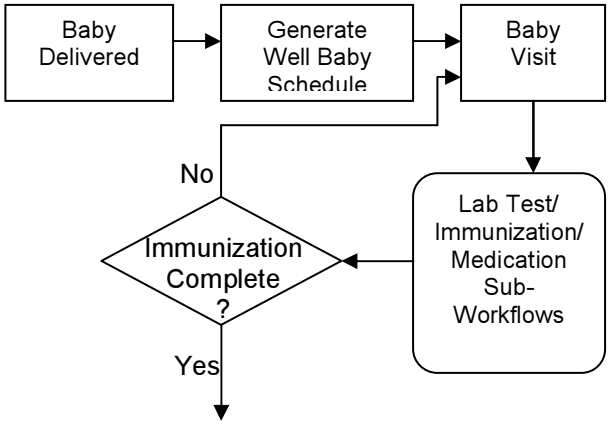

Figure 7. 'Well Baby Clinic' Workflow

5.4 Deviation from Workflow

All deviations from routine, whenever they occur, are noted with date-time-stamp and the clinician making the entry is asked to enter the reasons for deviation. The clinician details are also captured for future use in analysis.

The deviations are assumed to be visit-specific. So when the patient comes to the clinic for a subsequent visit, the system assumes that a new routine visit is taking place. The clinician may choose to follow the alternate pathway right away. He is also permitted to remove the patient permanently from subsequent follow-up by the system. This is necessary for a number of reasons, like pre-term delivery of baby, miscarriage, etc.

A double-blind process is proposed to be used to ensure equal assignment of the various users to the system. Those in the "study" group will follow the automated workflow-enabled system, while those in the "control" will follow the usual paper-based handwritten process that is currently in place in the institution where the pilot is proposed to be run. In order to ensure that no user bias enters, a clinician will have an equal number of patients assigned to him for study

Factors such as stakeholder acceptance of the process, time to process an order, and patient delight are proposed to be monitored from the first day. If during the course of the study it is discovered that the null hypothesis associated with them have been proven, then all patients will be migrated to the automated systems upon obtaining the proof. This will be done separately for the antenatal and well-baby clinics since although many stakeholders are expected to remain the same, the associated clinician, the vital cog in the workflow acceptance and efficiency wheel, will be different

If it is found that the null hypothesis is not proven and lives of patients are in danger, the project will be abandoned forthwith. A careful analysis regarding the cause thereof will be performed to ascertain the lessons learnt

5.5 Flexibility of the System

The application allows the system administrator to change any clinical data capture form field, control or sequence (flow). Let us assume that there is general agreement amongst the pediatricians that some immunization should be discontinued, some new ones

added, and some replaced by others that need to be administered at a different time interval from the previous ones. Using the system, these may easily be implemented. All the system administrator needs to do is to log in and go to the form design screen, open the appropriate form, make the necessary changes. Then open the form flow design screen and place the various inter-related forms in their desired sequence – each individual form has a unique identifier attached to it – and set the rules regarding when the respective forms will be displayed with respect to time intervals.

Through an audit trail a "reason for change" statement is recorded for each change with the user id and date-time stamp so that whenever required in future, all the background information regarding the change can be uncovered. Implementing such a change while maintaining tight regulatory and audit control in a paper-based process is more difficult and definitely time consuming as after incorporating the changes and instructing the various users to use the same, monitoring compliance are a job in itself.

In an automated environment, once the various forms have been changed, the consultant would visualize only the latest forms and not out-of-date or retired forms anymore. This would obviate the necessity for monitoring implementation altogether.

5.6 Advantages of Automated Patient Management Workflow

Several advantages have been assumed to accrue as a result of the implementation of this system. The null hypothesis is that there will be a statistically significant finding in that all the advantages would be proven to be true.

Some of the prime advantages are following:

- Stakeholders satisfaction level is increased with the use of the system.
- Overall Patient Satisfaction Index [(patient satisfaction level now – patient satisfaction level before)/patient satisfaction level before] increased.
- Per patient costs of care provided are decreased.
- Increase in patient flow to the organization is a direct result of implementation of the system.
- More patients can be handled in the same time period.
- Absolute Reduction in errors of omission and commission due to appointment scheduling.
- Absolute Reduction in errors of omission and commission due to investigation and immunization orders.
- Improved patient satisfaction due to ready access to results and next appointments through web-interface.
- Generally, the care providers' comfort level is more.
- Well accepted by the clinicians and nurses.
- Improved patient compliance due to ability to receive timely alerts regarding appointments due and ability to choose the data of one's choice for clinic/laboratory visit within the permitted boundaries.

6 Conclusion

Currently there exist a number of applications that allow any office work to be automated. Unfortunately, they are not centrally "governed" and consequently the user requires to "remember" the sequence of the work to be done and carry them out in the "right" order by running the required applications in sequence. This is true even if the entire work can be done from within one single application. "Handing over" the next work in sequence to be done to the designated user is not automated and neither are any messages exchanged to allow coordination. Menu-driven applications are the norm in almost all IT-applications. The maturity levels of such systems have either reached their maximal limits or are fast approaching this point.

The next generation of these applications would be workflow-driven rather than menu-driven. These would require the user not have to "remember" the sequence of the work to be done and then carry it out, unless there is an exceptional situation. The application will do the remembering and correct presentation of the appropriate activity to the user. It is highly unlikely that any work that can be done in its entirety by one single person. Any work routinely requires carefully coordinated team work where the various parts of any work being carried out by several persons who work in tandem. It is the line manager's, i.e., the one with the supervisory role, job to act as the conductor of this symphony. However, when any sequence is repetitive in a predictable manner with deviations happening only in exceptional situations, only superficial control is mandated. The valuable skills and time of the manager is poorly utilized if his job is only to focus on this monitoring activity. This inefficient utilization of resources assume greater significance when the requirement of ensuring efficiency at a same or, preferably, lower costs becomes a necessity for organizations. It certainly makes much more sense to formalize and validate the office work as a systemized process and have it automated. The system captures and reports all activities that are carried out using it, including those of omission and commission, through audit trail. It is imperative to have this feature so that the

acts of supervision, validation and future scopes of improvement can be measured. Without process improvement, all processes remain in a state of impending obsolesce.

E-Governance is all about IT-enabling governance, which is carrying out an activity through a set of inter-linked chain of generally agreed upon processes. The user, even if a novice, can easily come up to speed in his work efficiency as the act of "remembering" routine tasks is made redundant. It is important to note that deviations required in emergencies can also be IT-enabled, provided the process to be followed in those situations are known. These allow for any work to be done faster, in large volumes, in a transparent manner, in an essentially error-free easy-to-use environment. Such systems should also streamline the work to be done, thereby bringing in the much needed smooth functioning of any work place through the introduction of standards, thereby leading to a more efficient work environment.

Office work automation is already a reality, The logical next step in the evolution of any automated office is automation of the various office work processes. In healthcare, providing actual care to the patient, deciding which treatment to administer when after making a reasonably-certain diagnosis requires the "human touch". To aid all this work to be done more efficiently, while lowering costs and increasing productivity, requires that those activities that are essentially clerical in nature be devolved to an automated system. In order to make this happen, the two basic requirements are that well-made and standardized processes are used and that the users are cyber savvy.

7 References

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8 Author's Profile

Bhudeb Chakravarti brings with him more than 17 years of experience in IT field ranging from Requirement Management, Object Oriented Analysis and Design, UML, Rational Unified Process to Project Management and Delivery Management. He has worked in prestigious organizations like Computer Associates, Rational Software, Defence Research & Development Organisation and Schlumberger SEMA before joining Satyam Computers Services Limited. Being both an Electronics and Communication Engineer and an MBA, he is able to have a proper mix of technology and management. He has vast requirement and design experience using UML, OOAD and RUP and is an expert in case tools like Rational ROSE, RequisitePro etc. He has more than 20 publications including 8 publications in International journals and conferences.

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