



Research Paper

Reducing outpatients' waiting time in oncology clinic by improving management software

Accepted 25th October, 2017

ABSTRACT

As an important determinant of patient satisfaction, waiting time has gained increasing attention in the field of health care services. Our study aimed to reduce waiting time for oncology patients in outpatient clinic based on a software improving approach. Data collection, Fish-bone analysis, interviews and survey methods were used to study and analyze drawback in current management software in oncology outpatient clinics. Three main problems (medical history recording, patients' location and fault during prescription) were found as root causes for long waiting time. Improvements on software to aforementioned problems were introduced. A pre-post comparative study design was adopted to test the effect of solutions on reducing waiting time. From June to September, 2015, there were 6,842 oncology patients treated in outpatient clinic. The average time from patients' registration to treatment was 117 min, which consisted of a 59 min waiting time from registration to consultant and a 58 min waiting time from end of consultant to treatment. After improvements on software was introduced for the 7,179 patients who were treated in our clinic from June to September, 2016, average waiting time from patients' registration to treatment was 76 min, which consisted of a 42 min waiting time from registration to consultant and a 34 min waiting time from end of consultant to treatment. Meanwhile, an obvious decline in error rate of prescription was also observed. After detailed analysis, adoption of management software in outpatient clinic may be an effective way to achieve decreased waiting time for patients who suffered from oncology.

Wenxi Yu*, Zan Shen and Yiqun Mi*

Affiliated Sixth People's Hospital, Shanghai Jiaotong University, No. 600, Yishan Road, Xuhui District, 200233 Shanghai, People's Republic of China.

*Corresponding author. E-mail: miyiqun@126.com. Tel: +8618930172906.

Keywords: Waiting time, outpatient, management software.

INTRODUCTION

Patient flow is the most critical factor within the outpatient clinical settings, as it directly affects the patients' health and their satisfaction level (Rohleder et al., 2011; Hall, 2013). However, one significant drawback exists in hospitals: the long waiting time of patients in their clinics, which in turn affects the level of patient satisfaction as well as, the quality of the provided services. Since patients' health conditions may not be stable, extra waiting time could harm them. Previous studies confirmed that, beyond the quality of medical services, the satisfaction level of patients in outpatient services is related to waiting time (Aldebasi and

Ahmed, 2011; Marley et al., 2004; Cleary and McNeil, 1988; Druss et al., 1999).

In China, with the reforms of the medical insurance system, patients have more options to select institutions for their consultation that bring in increasing numbers of visits to hospitals for medical consultation and help. Consequently, hospitals are facing the challenge of improving service to meet demands of patients with limited staff resources. Many patients' complaints come from the long waiting time and long waiting times at outpatient clinics has been shown to be the major dissatisfaction with

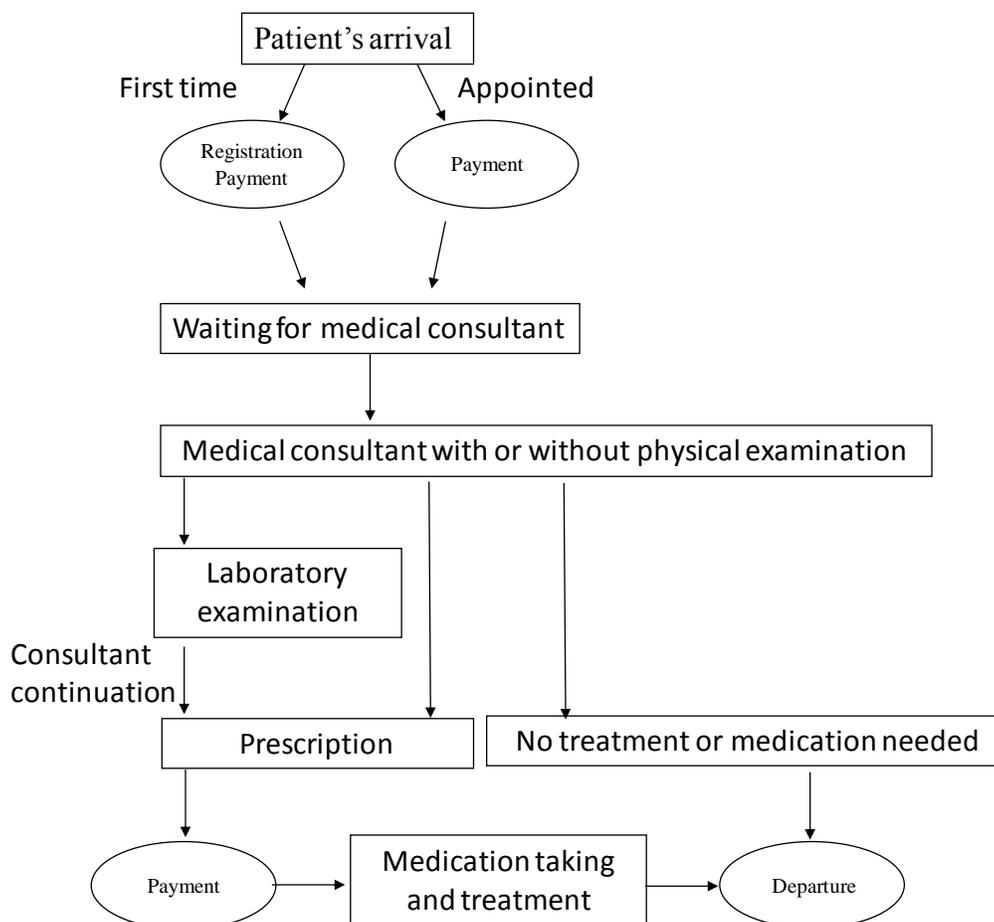


Figure 1: Process of medical consultation in oncology outpatient department.

medical care delivery and a barrier to further use of healthcare facilities by affected patients.

To decrease long wait times, healthcare institutions have proposed various solutions to overcome long waiting time problem in outpatient clinics, such as adding resident doctor into the outpatients clinic work (Haji and Darabi, 2011), adding volunteers (Yu et al., 2010), changing the appointment scheduling rules (Algiriyage et al., 2014) and administrating the mix-type registration (Lu et al., 2013). Somehow, these solutions depend mainly on adding more human resources or changing management policies to improve wait time. Professional resources in clinical medicine are limited in China and changing management policies in an institution is a multi-section work that could not be conducted easily.

Medical management software in outpatient clinics has been widely used not only in China, but also throughout the world. In our institution, the medical outpatient management software is an integrated software that covers process of history recording, examination and prescription. Thus, appropriate improvement would optimize patients' treatment process and reduce outpatients' waiting time. The present study focused on outpatient clinics of oncology in Affiliated Sixth People's Hospital, Shanghai Jiaotong

University with the aim to illustrate factors of long waiting time and explored possibility of addressing these factors based on a software improvement approach.

MATERIALS AND METHODS

The entire process of medical consultation in oncology outpatient department (Figure 1) includes different combinations of the following events: registration, waiting for consultation, consultation (which included simple physical examinations, such as auscultation or blood pressure measurement), physical examination, laboratory tests, diagnosis, treatment and payment. To address problems and causes behind long waiting time in the process, both quantitative and qualitative methods were considered.

Data collection, Fish-bone analysis, interviews and survey methods were used to study and analyze the drawbacks in current management software of oncology outpatient clinics. Real data from patients was collected from Affiliated Sixth People's Hospital's Outpatient Management Software (OMS). A Fish-bone cause-and-effect tool was chosen for analyzing the factors that had impacts on patient flow from

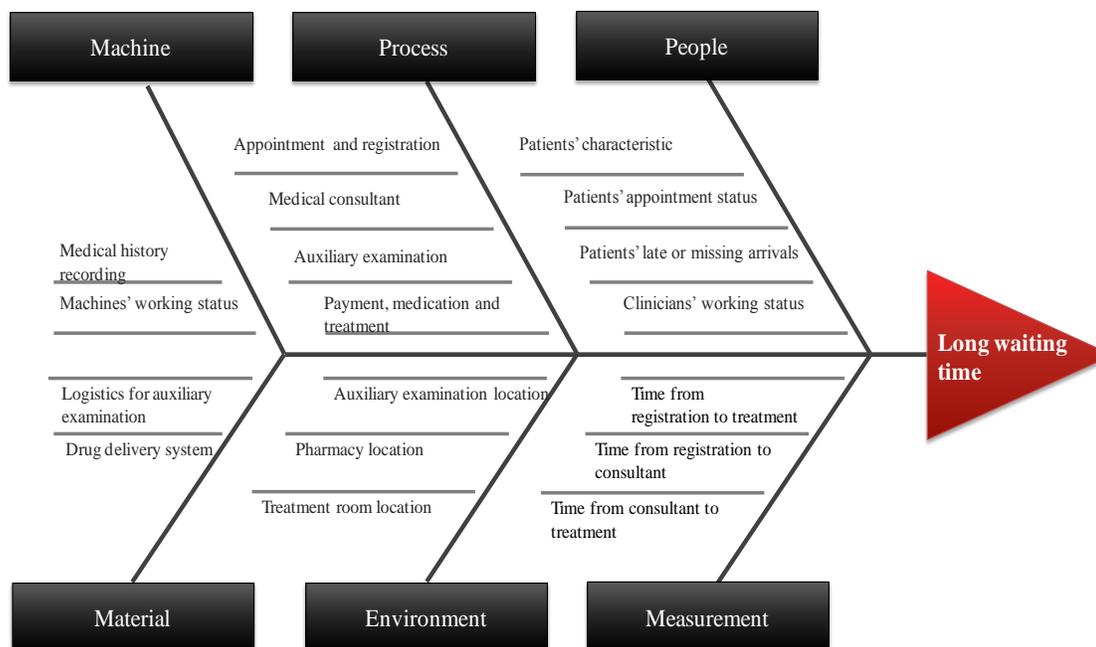


Figure 2: Root cause analysis fish bone diagram.

different perspectives (Figure 2). Fish-bone analysis (Komashie et al, 2015) is a diagram created by Kaoru (1968) showing the root causes of a specific event. Fish-bone is used to study the process from inside the outpatient management and find the root causes of the problem.

Interviews were conducted with clinicians in oncology out-patient clinic to determine the problems from an inside perspective in order to feed the Fish-bone analysis with a 100% response rate. Meanwhile, surveys were conducted to identify problems and where majority of problems are positioned from an outside perspective. The sample size was 500 patients. The survey was conducted through a face-to-face inside the institution through an anonymous manner with a response rate of 95.6%.

From interviews and survey, we had identified the most important reasons behind long wait times which directly affected the quality of service. After deep analysis, solutions were proposed and their impacts on patients' waiting time tested. We believed these experiences would be beneficial to hospital management on how to reduce patient waiting time and improve the quality of healthcare services.

All patients provided written informed consent. The study was approved by the independent ethics committee, Sixth people's Hospital, Shanghai JiaoTong University and conducted according to all applicable laws and regulations and the ethical principles of the Declaration of Helsinki.

RESULTS

In this case study, the biggest challenge was to identify the reasons behind the long waiting time in the oncology

outpatient clinic since this wait time aspect was the most important measure to increase patient satisfaction, resource utilization and overall clinic management. Consequently, achievement of significant decreases in the total waiting time could be checked after solutions are adopted.

Findings from patients' data analysis, interviews and surveys

Statistical analysis of patients' data in oncology outpatient clinic was taken in the period from June to September, 2015, including 6,842 patients. Among these 6,842 patients, 2,928 patients were males (42.8%), 3,914 were female (57.2%). Ages of the patients ranged from 4 to 90 years, with a mean age of 54.21 years. The category of malignancy were: 1,410 cases of breast cancer, 1,106 cases of primary lung cancer, 1,282 cases of digestive system, 336 cases of female reproductive system, 691 cases of urinary system, 355 cases of head and neck neoplasm, 1,499 cases of bone and soft tissue sarcoma and others. Only 9.1% of the patients had a bachelor degree or higher. 1,678 patients (24.54%) were local residents while the others (5,164 patients, 75.46%) were from other regions.

The average time from patients' registration to treatment was 117 min, which consisted of a 59 min waiting time from registration to consultant and a 58 min waiting time from end of consultant to treatment.

Through data analysis of 6,842 patients, interviews with clinicians and surveys from patients, several root causes which caused long waiting time was found based on Fish-

bone analysis, including medical history recording problems during consultant process, patients' location problem during treatment process and fault during prescription process.

Medical history recording problems and solution:

Interviews with clinicians in oncology outpatient clinic demonstrated that during consultant process, medical history recording for patients on initial treatment would cost majority of time. Statistical analysis of patients' data had showed that among 6842 patients (1,678 local, 5,164 from other region), 3,970 patients (252 local, 3,718 from other region) were on their first time to our hospital. Further analysis indicated that for those 3,970 patients, 2,845 patients previously had visited another or more hospitals in Shanghai.

After investigation, we proposed a solution that could reduce time cost in medical history recording, especially for those patients who were on first visit to our institution. In Shanghai's clinics for inpatient and outpatient, doctors recorded medical history by electronic medical record system. Somehow, our outpatient's management software could only trace history of patients who were previously treated in our hospital. Thus, by utilizing improvement that management software could trace history of patients treated in other clinics of Shanghai previously, time cost in medical history recording would be remarkably alleviated.

Patients' location problem and solution

In the institution, places for examination (that is, radiology, type-b ultrasonic and blood test), pharmacy, injection and transfusion were scattered in different buildings. Surveys from patients revealed that majority (5,136 patients, account for 75.1%) said information for position indication was not clear and they often got confused in real-time location during treatment process.

Thus, two solutions were proposed to cope with this problem. First, an improvement on outpatient management software was added which could print a paper guidance on how to later process it. Following the steps on the paper guidance, possibility of patients' confusion in location was reduced to minimum. Secondly, since 95% of patients had a smart mobile phone with iOS or Android system, a real-time location tracking system based on Wechat app, one of the most popular social interaction software, was introduced on wireless local area networks. This real-time location tracking system allowed patients to track their live location on their cell phone after sending a requiring message to client-side of outpatient management software.

Fault during prescription and solution

Surveys from patients demonstrated that error in

prescription usually made them loop between consultant room and pharmacy. Statistical analysis showed an error rate of 10.1% (525 out of 5,199 prescriptions, 98 in drug over dosage and 427 in drug incompatibility). Further investigation indicated medication safety and alarm system was only integrated into pharmacist-side of outpatient management software, but absent in clinician-side of the system, which resulted in separation between consultant room and pharmacy. Thus, fault in prescription, such as over dosage and incompatibility among prescriptions, would be discovered only in pharmacy while patients went to take medicine.

By adding the medication safety functions into clinician-side of the system in outpatient clinic, the live alarm would come out on the computer screen to inform the doctor in the case of error in prescription. We assumed that this improvement would help doctors to reduce prescription's error.

Results after adoption of outpatient management system

A pre-post comparative study design was adopted to check out the effect of the solutions earlier mentioned (Figure 3). Data from 6,842 patients in June to September, 2015 was treated as pre-year. We collected data of patients from June to September, 2016 as a post-year and compared them with those in 2015.

From June to September, 2016, there were 7,179 patients treated or consulted in oncology outpatient clinic in our institution. Among those patients, 3,252 patients were males (45.3%), while 3,927 were females (54.7%). Ages of the patients ranged from 3 to 88 years, with a mean age of 55.43 years. The category of malignancy were: 1,622 cases of breast cancer, 1,231 cases of primary lung cancer, 1345 cases of digestive system, 354 cases of female reproductive system, 714 cases of urinary system, 391 cases of head and neck neoplasm, 1354 cases of bone and soft tissue sarcoma and others. 10.2% of the patients had a bachelor degree or higher. 1874 patients (26.1%) were local residents while the others (5305 patients, 73.9%) were from other region. The proportion of gender, age, malignancy category and education level was well balanced between two groups.

Among 7,179 patients in our oncology clinic from June to September, 2016, average waiting time from patients' registration to treatment was 76 min, which consisted of a 42 min waiting time from registration to consultant and a 34 min waiting time from end of consultant to treatment. Significant difference was observed in terms of total waiting time (reduced by 35%), time from registration to consultant (reduced by 28.8%) and time from consultant to treatment (reduced by 41.3%).

In addition, an obvious decline in error rate of prescription was noticed in the study, from 10.1 to 2% (132 out of 6,024 prescriptions, 64 in drug over dosage and 68 in drug incompatibility), especially with a remarkably

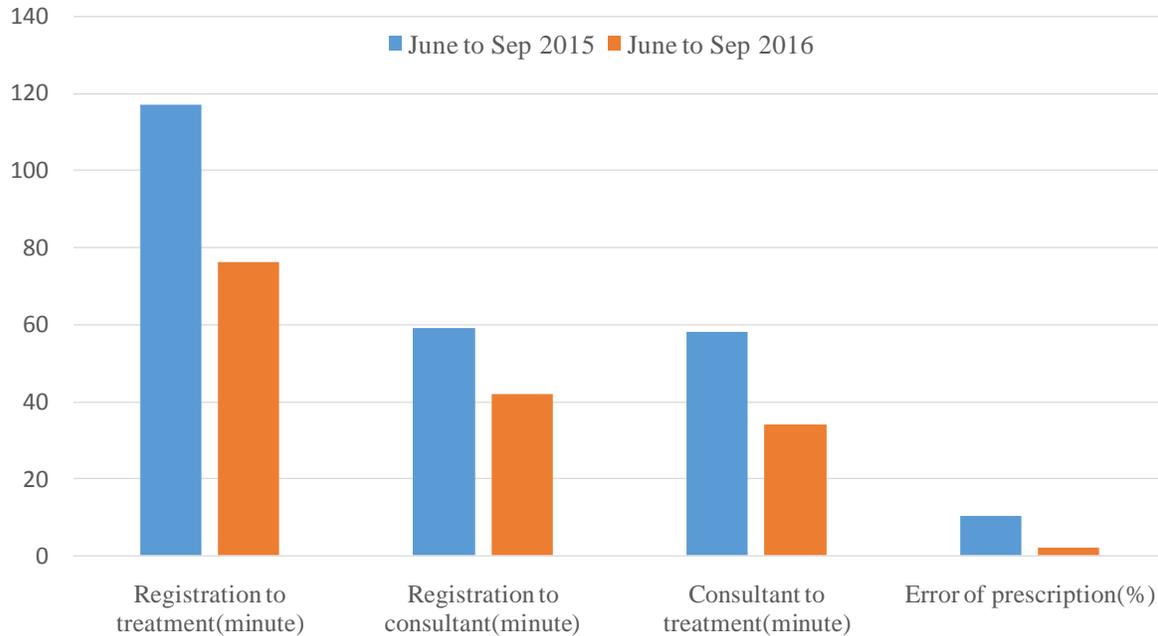


Figure 3: Effect after adoption of outpatient management system.

descendant in error of drug incompatibility (reduced by 84%).

DISCUSSION

Patient satisfaction is a worthwhile goal of health care service (Shea et al, 2008; Xie et al, 1998; Zhang et al, 2009; Chand et al, 2009) and there are a lot of reasons for implementing plans to achieve it. It was suggested that waiting time is the most important determinant of patient satisfaction and waiting time statistics have become an important standard by which health care is measured (Su et al, 2009; Kawakami et al, 2008; Aboumater et al, 2008). Waiting time statistics also hold great promise to facilitate the evaluation of performance of health care institutions (Bungard et al, 2009; Wu et al, 2004; Kim et al, 2009; Williams et al, 2008; Slowiak et al, 2008).

Long waiting times induce negative effects on the quality of the hospital before finally crippling the competitive advantages of the hospital. Understanding the current situation of waiting time and exploration of possible strategies to reduce waiting time are the objectives of the present study. Long waiting time in an outpatient setting is very common in hospitals in either Shanghai or other cities of China. Previous solutions often depend mainly on adding more human resources or changing management policies. With a background that medical management software in outpatient clinics has been widely utilized, appropriate improvement on software could reduce patients' waiting time.

Implementing a new improvement on management software often requires additional changes in the current

working process. Thus, a precise analysis for root cause which induces the long waiting time is needed. Through data from patients suffered from malignancy, interviews and surveys with clinicians/patients, this study revealed that medical history recording, patients' live location during treatment process and fault during prescription were three major reasons for long waiting times.

As one of the biggest metropolis in China, Shanghai has the best healthcare resource throughout mainland. Each year, millions of patients who are not located in Shanghai come to seek superior medical service, which brings an increasing workload for clinicians, including oncology clinicians. Since medical history recording system could not be shared online among different provinces, oncology clinicians in outpatient clinic must cost mass of time to inquiry previous medical history of patients who are on initial treatment, especially in situation that prognosis for many malignancy has become better and better. A distinct case was when an oncology clinician told us that he once spent nearly 40 min to understand a breast cancer patients' medical history, which consisted of four operations, three cycles of radiation treatment, chemotherapy which treatment lasted one year, and four years endocrinotherapy.

In addition, during the history recording, there were 35 oncology patients waiting for the consultant. Data analysis demonstrated that among the patients on first visit to our hospital, majority consulted other clinics in Shanghai. Since medical history online share system had been adopted within some top Shanghai clinics/hospitals, we quickly implemented the access function into our outpatient management software so that oncology clinicians could acquire patients' data on online share system. As we expected, this improvement obviously reduced medical

history recording time, especially on those oncology patients with a prolonged and complicated treatment history. In the future work, we would propel the online medical history system among provinces with governmental institution to facilitate clinician routine work.

Modern comprehensive hospitals often occupy large area with numerous buildings used for ward, pharmacy, outpatient treatment/consultant, auxiliary examination, logistics, basic research and executive administration. This complicated layout often makes patients on first visit confused and strolled aimlessly. Thus, a printed paper guidance on how to process next would be a very beneficial assistant. Considering that smart mobile phones with GPS system has been widely installed and majority of patients have purchased one or more phones, a real-time location tracking system based on wireless network was implemented to facilitate guiding patients to proper destination. Thus, an overall improvement in location efficiency for patients was noted.

Most categories of malignancy, such as lung cancer, gastric cancer, colon cancer and breast cancer, have a high morbidity at age of 40 to 60 s, which is also the high incidence period of many diseases like hypertension, diabetes, arrhythmia, myocardial ischemia, hepatitis, chronic bronchitis and gastroenteritis. As a result, many oncology patients will take one or more prescription of medicine targeted on the nontumorous disorder earlier mentioned. In pharmacology, some of these drugs might have incompatibility with anti-cancer drugs. Somehow, it is too difficult for clinicians to major in oncology and remember all potential incompatibilities. In previous time, this drawback would only be checked out while patients were taking anticancer prescription in pharmacy. After adding the drug-compatibility function into the clinician-side of software, clinicians would discover the potential problem during prescription, rather than make patients go to pharmacy for nothing.

This study should be viewed in the context of our study's limitations. One of the limitations is the bias associated with survey research in general; the findings might not be generalized to other hospitals with different demographic characteristics, staff and resources. The analysis could be limited by the sample size and by only being conducted in the summer time and thus lack statistical power. Additional attention should be paid to differences with other studies that used different inclusion criteria. Despite these potential limitations, our improvement on outpatient management software had merits. First, to develop this system, we did not incur much additional cost; the largest additional cost was that associated with amendment on software system. Secondly, the use of this system does not require additional manpower. In future analyses we will consider patients suffered from nontumorous disorder during other period, and try to incorporate the information into our study in effect of software improvement in reducing patients' waiting time.

In summary, our results provide some insights into the

waiting time, which is a barrier to healthcare delivery in mainland of China. Adoption of improvements in outpatient management software after detailed analysis of patients' data, surveys and interviews may be effective ways to cope with long waiting time.

ACKNOWLEDGEMENT

This study was supported by NSFC 71373159 (NSFC: National and Natural Science Foundation of China) and Clinic Developing Project by ShangHai Shengkang Medical Center (No. 2016617).

REFERENCES

- Aboumatar HJ, Winner LE, Davis RO, Trovitch PB, Berg MM, Violette KM (2008). No time to waste: decreasing patient wait times for chemotherapy administration using automated prioritization in an oncology pharmacy system. *Am. J. Manag. Care.* 14: 309-316.
- Aldebasi YH, Ahmed MI (2011). Patients' satisfaction with medical services in the Qassimarea. *J. Clin. Diagn. Res.* 5:813-7.
- Algiriyage N, Sampath R, Pushpakumara C, Wijayarathna G (2014). A simulation approach for reduced outpatient waiting time. In: *Advances in ICT for Emerging Regions IC Ter.* 128-33.
- Bungard TJ, Smigorowsky MJ, Lalonde LD, Hogan T, Doliszny KM, Gebreyesus G (2009). Cardiac EASE (Ensuring Access and Speedy Evaluation)-the impact of a single-point-of-entry multidisciplinary outpatient cardiologyconsultation program on wait times in Canada. *Can. J. Cardiol.* 25:697-702.
- Chand S, Moskowitz H, Norris JB, Shade S, Willis DR (2009). Improving patient flow at an outpatient clinic: study of sources of variability and improvement factors. *Health Care Manag. Sci.* 12:325-340.
- Cleary PD, McNeil BJ (1988). Patient satisfaction as an indicator of quality care. *Inquiry.* 25-36.
- Druss BG, Rosenheck RA, Stolar M (1999). Patient satisfaction and administrative measures as indicators of the quality of mental health care. *Psychiatric Serv.* 50:1053-8.
- Haji M, Darabi H (2011). A simulation case study: Reducing outpatient waiting time of otolaryngology care services using VBA. In *Automation Science and Engineering CASE.* 525-30.
- Hall R (2013). *Patient flow: reducing delay in healthcare delivery.* Springer Science and Business Media.
- Kawakami J, Hopman WM, Smith-Tryon R, Siemens DR (2008). Measurement of surgical wait times in a universal health care system. *Can. Urol. Assoc. J.* 2:597-603.
- Kim YK, Song KE, Lee WK (2009). Reducing patient waiting time for the outpatient phlebotomy service using six sigma. *Korean J. Lab. Med.* 29:171-177.
- Komashie A, Mousavi A, Clarkson PJ, Young T (2015). An Integrated Model of Patient and Staff Satisfaction Using Queuing Theory. *IEEE J. Theory Trans. Eng. Health Med.* 3:1-10.
- Lu TP, Kittipittayakorn C, Shih JT, Lian GF (2013). Improving outpatient service quality in department of orthopedic surgery by using collaborative approaches. In *Computer Supported Cooperative Work in Design CSCWD.* 515-20.
- Marley KA, Collier DA, Meyer Goldstein S (2004). The role of clinical and process quality in achieving patient satisfaction in hospitals. *Decis. Sci.* 35:349-69.
- Rohleder TR, Lewkonja P, Bischak DP, Duffy P, Hendijani R (2011). Using simulation modeling to improve patient flow at an outpatient orthopedic clinic. *Health Care Manage Sci.* 14:135-45.
- Shea AM, Curtis LH, Hammill BG, Di Martino LD, Abernethy AP, Schulman KA (2008). Association between the medicare modernization act of 2003 and patient wait times and travel distance for chemotherapy. *JAMA.* 300:189-196.

- Slowiak JM, Huitema BE, Dickinson AM (2008). Reducing wait time in a hospital pharmacy to promote customer service. *Qual Manag. Health Care.* 17: 112-127.
- Su HY, Sykes PH, Su HY, Sykes PH (2009). Waiting times for gynaecological cancer surgery. *N Z Med J.* 122:26-33.
- Williams ME, Latta J, Conversano P (2008). Eliminating the wait for mental health services. *J. Behav. Health Serv. Res.* 35:107-114.
- Wu Y, Zhang Y, Li YQ, Hong BL, Huang CX (2004). Factors associated with the extent of care-seeking delay for patients with acute myocardial infarction in Beijing. *Chin. Med J.* 117:1772-1777.
- Xie J, Wang J, Yang H (1998). Hypertension control improved through patient education. *Chinese PEP Investigators. Chin. Med J.* 111:581-584.
- Yu Y, Li feng W, Huang H, Perera T (2010). Notice of retraction modeling and simulation of an outpatient service system. *Computer Application and System Modeling ICCASM.* 2:2-691.
- Zhang Q, Zhang RY, Qiu JP, Jin HG, Zhang JF, Wang XL (2009). Impact of different clinical pathways on outcomes of patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: the RAPID-AMI study. *Chin. Med J.* 122:636-642.

Cite this article as:

Yu W, Shen Z, Mi Y (2017). Reducing outpatients' waiting time in oncology clinic by improving management software. *Acad. J. Educ. Res.* 5(10): 392-398.

Submit your manuscript at

<http://www.academiapublishing.org/ajer>