



**"Enforcing the Strategic Role of Health Information Managers
in Developing Better Countries"**

25th PORMIKI & 3rd IFHIMA SEAR Conference

18th - 21st February 2014 | Yogyakarta, Indonesia

Yogyakarta, 3 February, 2014

Dear Al Asyary

Thank you for submitting your paper entitled:

**"Computerized Physician Order Entry (CPOE) On Prescribing At GMC Health Center,
Yogyakarta: A Case Study"**

To **"The PORMIKI Silver Anniversary & 3rd Conference of International Federation of
Health Information Management Association South East Asia Region (IFHIMA SEAR)
2014"**

We are pleased to inform you that the paper is suitable for presentation at the conference as
Oral Presentation on Section B: Electronic Health Record (the paper code: *PC2.B2.1*).

Your schedule on 19 February 2014, at Room B (15 minutes) to be held at Sheraton Mustika
Yogyakarta Hotel.

Please send the Full Paper in word format (.doc) and presentation material in powerpoint format
(.ppt) and also curriculum vitae.

As a requirement of your presentation, please register your self for the conference before 5
February 2014, are:

Rp. 2.500.000,00 (PORMIKI member)

Rp. 3.000.000,00 (non PORMIKI member)

payment could be transferred to

- Name : Ibnu Mardiyoko
- Bank Name : **Bank Rakyat Indonesia (BRI)**
- Bank Branch : KCP RS Bethesda
- Account Number : 0514-01-036607-50-8

Please send your payment confirmation by the email: secretariat@pis2014.com or
secretariat@pis2014.org, and nur3yati@yahoo.com

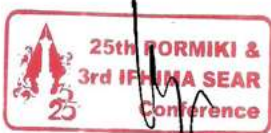
If any circumstances which is not clear, you can contact our office or through the short
message service via Nuryati (+62818464494; email: nur3yati@yahoo.com).

We are looking forward to seeing you in the conference.

Thank you.

**The PORMIKI Silver Anniversary & 3rd Conference
Of IFHIMA SEAR 2014**

Organizing Committee,
Best Regards



Ibnu Mardiyoko, MM.
Chairperson



COMPUTERIZED PHYSICIAN ORDER ENTRY (CPOE) ON PRECSRIBING AT GMC HEALTH CENTER, YOGYAKARTA: A CASE STUDY

ABSTRACT

Al Asyary¹, Hari Kusnanto², Anis Fuad³

In major of its applying, CPOE has been shown to improve patient safety by reducing medication errors and subsequent adverse drug events (ADEs). Medication error such as elixir in writing, determination of dose and correct drug type use at patient with the certain health condition in health service can be depressed. But, and so do own the negative impact. One of them is the existence of time addition in entry of patient information by physician which is potential event for being an error(s) on prescribing activity. The goal was to describe the CPOE on prescribing, also as known as electronic prescribing, in academic health facility of GMC Health Center. This case study design, depth interview and observation was conducted in academic healthcare facility GMC Health Center. The subject was physician and farmacist as end-user of CPOE system on presribing. From interview guide and check list observation tools was obtained that CPOE in GMC Health Center have influenced by some principles from existing themes. Ease of use and usefullness perceptions had been change end-user's mind about implementation of this systems.

Keywords: CPOE, prescription, perceived of end-user, patient safety

¹ Student, Doctoral Program of Public Health Science, Faculty of Public Health, University of Indonesia

² Professor, Graduate Program of Health Management Information Systems, Public Health Departement, Faculty of Medicine

³ Lecturer, Graduate Program of Health Management Information Systems, Public Health Departement, Faculty of Medicine

INTRODUCTION

Medication errors can occur at all stages in the medication process, from prescription to drug management (Colpaert et al., 2006). This result due as effect to poor health care management which is resulting injury in patients referred to as adverse events. Adverse in medication prescribe is the most frequent adverse events occur due as impact to less service management prescriptions (Battles and Lilford, 2003), especially if the prescription failed in assessing the drug relevance with patient characteristics. It supposed by prescription dosage and drug interaction which is dangerous to patients with certain pathophysiological history e.g. renal failure or elderly patients (Kuperman et al., 2007).

A systematic approach is needed to prevent and decrease prescription errors in medication with data and information entry mechanism to accordance medical services for patients. It is entered by the physician, not only to provide best decisions, but also can reduce prescription errors that named by clinical decision support (CDS) (Galanter et al., 2005). It includes computerized tools to improve health care for patients, which consisted of alert and advisor system in drug, dosage, interactions, allergies, and subsequent services selection computerizedly (Kaushal et al., 2003).

Computerized Physician Order Entry (CPOE) system is an application which can be defined as an electronic application that is used by physicians to order service in drug prescriptions, laboratory tests, and consultations (Poon et al., 2004), that can be used by or without CDS (basic CPOE). Stand-alone CPOE (without CDS) has been able to demonstrate to decrease errors in treatment. Drug-prescribe orders to pharmacy with CPOE showed a positive impact, particularly in service time efficiency (Wess et al., 2007). Moreover, as it function as electronic prescribing, CPOE without CDS shown to reduce errors prescribing in health services, especially in academic health care facilities (Devine et al., 2010).

Beside to the positive impact, some reasons to explained why the CPOE is still obstacles in its implementation. It could be known as negative impact for this systems, such as the cost, physician resistance, concerns about interference in practice and reduces productivity, fear of technological failure, as well as the inability of CPOE systems integrate with existing health systems (CPOE system interoperability integration) (Campbell et al., 2009). These problems causes such user reaches a unanimous agreement to removing the CPOE in their health system (Berger and Kichak, 2004). One of reason is time addition, especially when the special unit entry data and information services (Ash et al., 2006).

METHOD

Health academic setting was studied tries to describe CPOE systems implementation. GMC Health Center is the academic health facility that implemented CPOE system for recent decade. Subject consisted by doctor was asked to explained their perceived by using Ash et al. (2007) transcript. The qualitative triangulates proved with CPOE system database (source triangulate), workflow observation (process triangulate), and pharmacy and clinic management depth interview (method triangulate).

RESULT

CPOE system is clinical information systems applications in GMC Health Center, where doctors have easy access to perform medical services, particularly in ordering medications to patients. User's perception of CPOE is the most meaningful things in the adoption of information systems. Learn from the results of research conducted by Ash et al. (1998) generalize that CPOE used in-effectively by 1/3 hospitals in the United States users which adopted this systems (Ash et al., 1998).

CPOE system in GMC Health Center enables the Doctor entries the order services and pharmacist receives as a request to a patient treatment. In this case, CPOE system has certain value in its function as supporting existing work flow, which makes users motivated to influence the behavior of the application when using this system.

a. Perceived of Usefulness

The best thing about this system as user's perceived is efficiency and effectivity to support their work. It obtained significant value, especially for reporting and presenting information for management decision making as well as providing information for doctors in patient services. Beside that, CPOE is also being able to integrate with drug inventory and provides an alert to selected drugs when drug are running of or expire. Ease of use perspective stated that CPOE lead rather than paper-based medical record.

"...dari segi positifnya kan kita cepet, ya, dalam arti data itu lebih tersimpan, lebih aman daripada kertas-kertas dikumpulkan daripada nanti cepat hilang, kalau ini kan, apa namanya, bisa kita upgrade lagi ya, bisa kita lihat lagi tanpa perlu mencari-cari dengan cepat kita dapatkan, kelebihanannya itu. Terus yang kedua, apa namanya, datanya ini paten, tidak bisa dihapus, tidak bisa dimanipulasi orang lain ya ... yang ketiga, kelebihanannya itu nanti, apa namanya, membuat sistem lebih cepet ya, daripada kita pakai sistem kertas ya" (respondent A5)

Even though that, the current system is not able to provide decision support in drug interactions, between drug interaction, nor drug interaction with patient pathophysiology with prescribed medications automatically yet. It differences with other functions CPOE system which is to give alert when doctors prescribe drugs that are contraindicated with other drugs (Devine et al., 2010) or to determine disease contraindications with prescription medication (Kuperman et al., 2007).

Moreover, the CPOE system has absence of mechanisms to notification system that included a new drug in a drug warehouse with existing applications. Sometimes doctors need to contact the pharmacy/drugstore to ask drug substitutions when drugs which usually prescribed for certain diseases depleted. It also needs to ask a new drug that has not entry by pharmacy in the application of existing systems. These problems become very essential especially for new doctors who practice in the GMC Health Center.

“.. yang sulitnya itu ... obat, kalau kita gak hafal obatnya apa yang ada di sini, itu sulitnya di situ. Apalagi kalau ada obat baru, gak diinformasikan, kadang-kadang gak tercentang, biasanya kita langsung nulis aja, gak lihat, obatnya sekarang opo to, kalau gak biasanya kita nulis, kalau keluar berarti masih ada, kalau gak berarti udah habis, biasanya gitu kan, kalau di sini sistemnya kayak gitu” (respondent A3)

The CPOE development needs to integrate with business processes to accordance GMC Health Center medical service workflow. It means to develop applications interface which is more interactive to the user. In the other words, it is not to be opposite, such as rigid and gets resistance from users (Berger and Kichak, 2004).

“... usulnya yang tadi kalau bisa nama generiknya dulu di depan terus nama patennya, itu kayaknya membantu untuk yang baru. Karena jelas kita semua tahu obat generiknya, nanti patennya mau pakai produk yang mana itu kan. Mending awalnya dulu yang generiknya, terserah mau pakai yang merk apa gitu kan. Saya rasa itu cukup dan membantu sekali program” (respondent A9)

Furthermore, the significant difference between general practitioner and specialist is arising problem. The need of the specialist physician diagnosis more specific to the specialization of expertise becomes an issue as well. It is not provided by the application of existing CPOE system. So, it implicates to efficiency of the patient's medical record.

“... ada beberapa diagnosis, yang karena saya kan spesifik kan, ada yang tidak ada gejalanya, jadi harus ngetik lagi diagnosisnya apa, lain-lain, gitu” (respondent A5)

b. Behavior of Order Entry

It is identified to explore the occurrence of medication errors (error prescribing) with entries made by doctors in the CPOE system in the GMC Health Center. This point aims to ensuring patient safety especially to reduce error prescribing (potential/preventable adverse drug events) which is the main function of CPOE system (Schedlbauer et al., 2009). In addition, the ease of use of system which is related to efficiency of services provided to patient. It includes the doctor's habit when performing medical services to patients by the CPOE application system.

The result shows some doctors whom entry patient data into the CPOE application system after obtaining the answers of all the items they want to know the history. Only a few doctors whom had entry patient information after the entire procedure on a patient were completed. This causes much less biased information because the data given direct patient is entered, compared to the data entered by the doctor after the patient out. It could be potential for doctor to forget any information who was obtained. When patient information is forgotten, it indicates that patient information entry is more likely to exist than the entry blank while history. The use of CPOE systems applications for doctors is giving a different effect for each physician. It impacts on the efficiency of patient record information which is directly contribute to the safety of the patients (Callen et al., 2006).

However, it turns out to create unintended consequences. One of the major factors that have contributed to the occurrence of medication errors is a failure in communication (Schaubhut and Jones, 2000). The changes type that may occur unintended consequence which is resulting from the use of CPOE systems are changes in communication patterns and practices by physician to patient healthcare. The use of CPOE applications systems by physicians to entry the patient data can lead to some unsatisfactory reduction in face to face communication of patient healthcare, which could be increase the potential errors was made (Ash et al., 2006). It is influenced adequately by the habits of doctors working with the clinical information systems (computer literate), history of using the system application in another workplaces or familiarity information technology tools (such as computer, PDA, smartphome, etc.).

"... sekali aja kok, setelah itu pakai sendiri ... kira-kira 3 kali ketemu/make, udah familiar dengan sistem ini" (respondent A7)

"... mungkin kebiasaan kita gak bisa ngetik cepat, jadi serius gini, kalau misalkan cepat, enak e, sambil lihat pasien/tatap muka dengan pasien, ada kontaknya ya, ya alhamdulillah jadi bisa" (respondent A9)

Furthermore, the problem that arises as a result of physician familiarity is frequent data entry errors by doctors. It is more likely the doctor accuracy when entry the patient data which is affected by the numerous of patients. In addition, existing features do not support the interfaces of CPOE applications system for the doctor, such as small font when they wanted to hit as an option of medical care to patient.

“... sempat error ketika pertama kali pakai aplikasi ... masalahnya itu pertama itu, ketika ngeklik terapinya, kadang-kadang ngekliknya atas, yang masuk bawah, memang resikonya, jadi memang harus ada dibetul. Terus yang kedua kadang-kadang karena kita tergesa-gesa ya, masuk data, pasien di luar karena sudah banyak, udah langsung datang, kita lupa belum ganti nama, itu sering terjadi gitu. Ketika udah mau selesai, dicek loh, kok, nama saya kok gak ada pasiennya, ternyata masuk ke pasien dokter yang sebelumnya, itu sering terjadi juga. Itu dua itu, yang bikin error-nya di situ, ngetik diagnosis, ngetik obat, sama induk oral, itu yang kadang-kadang sering” (respondent A5)

Moreover, from the completeness analysis showed that physician tend to entry complete if it just to select the item of data for be entered than if it had to type in the layout of existing CPOE application systems. This showed in the field of diagnosis. it is more likely complete than physical examination columns.

Specification differences between specialists with general practitioners can also be a cause of susceptibility to happen medication errors using CPOE system. It is influenced by the number of patient visits to the doctor. Poor of prescription errors indicates the proportion of the number of patient visits is low (Schaubhut and Jones, 2000). In a very significant, error prescribes of specialist much less than in the general practitioner. Workload can impact to medication error which is influenced by the type of physician, patient, and the circumstances when medical services (Callen et al., 2006). Thus susceptibility prescription errors are much more at risk than the general physician specialists.

“... saya udah jadi dokter umum di sini, dan udah ngerasakan gimana, gitu, sampai sekarang karena banyak sekali pasien, jadi memang agak crowded kalau pakai komputer. Tapi kalau spesialis kan, pasiennya gak begitu banyak, jadi masih bisa ngetiknya habis, pasiennya pulang” (respondent A5)

“... saya kan pasiennya sedikit, tidak begitu banyak ya, kalau pasiennya banyak, susah, karena harus banyak ngetik, tek-tek-tek, gitu. Kadang-kadang ada yang ngetik gitu tanpa melihat pasiennya, jadi komunikasinya tidak begitu pas ya, ada yang sampai ngetik gitu, tapi gak lihat pasiennya. Kadang-kadang kalau kita diajak ngomong misalnya tanpa memandang matanya, kadang-kadang ada orang yang gak suka, ada yang tersinggung, itu yang kelemahannya di situ. Tapi karena saya di sini juga pasiennya gak banyak ya, maksimal 12 orang ya, saya masih gak masalah, karena begitu pasien datang, saya gak pernah ngetik, jadi langsung ngomong, jadi begitu dia keluar, baru saya ketik, gitu. Tapi

kalau saya nanti pasiennya banyak, kayak dokter umum gitu, susah gitu, karena nanti pasiennya lebih dari sepuluh itu harus ngetik cepat, karena pasiennya lagi nunggu”
(respondent A5)

DISCUSSION

a. Workflow of CPOE System

GMC Health Center is an academic health care facility which has implemented CPOE system as clinical system for ten years currently. It was established to support health care for Gadjah Mada University academic citizens, especially in service treatment.

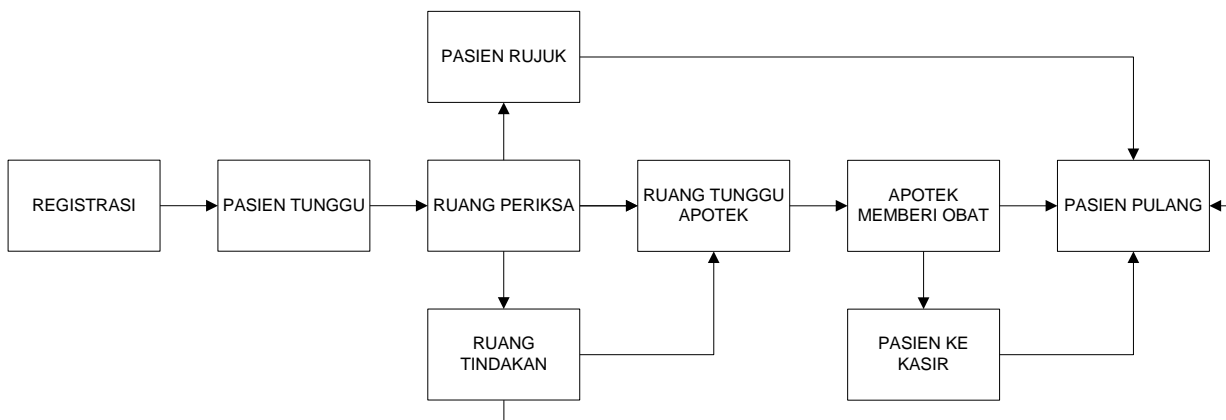


Figure 1. Workflow process in GMC Health Center

Physician enters the patient data and transmitted to pharmacist as an order for treatment plan. The CPOE systems also provides alert to drug stock availability, which is delivered electronically as a medical procedure to be performed.

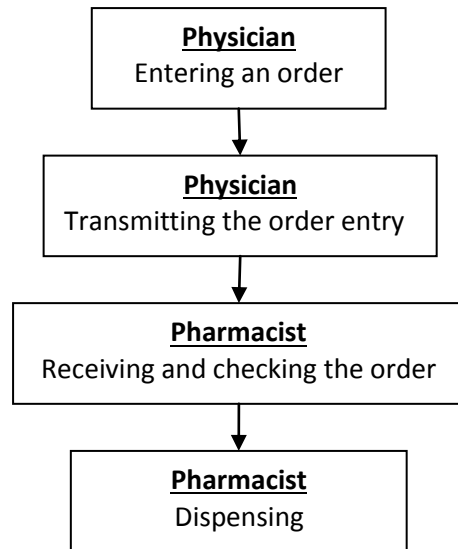


Figure 2. Flow of CPOE system on Prescribing in GMC Health Center

Harmony between technology, users and their work is a decisive factors of system efficiency and effectiveness to support workflow in health care (Callen et al., 2006). Therefore, it is potential to consider an important indication of successful CPOE implementation, particularly for its impact in reducing medication errors and improving patient safety. It has been brought the workflow concept into the forefront that need to be explored in the implementation of a CPOE system at healthcare facilities (Niazkhani et al., 2009).

b. Perceived of Ease of Use

The background initiation shows that increasing number of patients with different characteristics, making paper-based contains patient data and information are overlapping increasingly. It is making their use tends to minimum. In addition, physician shift, which makes sometimes it difficult to neither understand nor read own colleagues in patient medical records. Health financial is provides to indicate profits for patient healthcare with acquired premiums is a major aspect for health care facilities, which focuses on equity of health, one of which was promised by this application. In addition, recruitment of medical recorder for paper-based medical record feels reduce operational costs, which is perceived to be detrimental compared with application maintenance.

c. Perceived of Usefulness

It starts from the constraint and the desire to improve the quality performance to minimizing medication errors, which is major reason of CPOE system implementation in health-care facilities in developing countries. Some errors happen on prescribing patterns which patient care was still paper-based. It was making the loss of patient information is a difficult thing to overcome. In addition, also, the decision related to healthcare policy based on existing patient data, is a very important thing.

“... Jadi kalau sistem aplikasi ini tujuannya memang pertama beranjak dari waktu itu ada beberapa kendala ketika kita menggunakan sistem kertas ya ...” (respondent A1)

“... kemudian juga berawal dari sistem ini kita juga merasa kita butuhkan ketika melaporkan sesuatu itu, pelaporan, terutama sistem pelaporannya bisa lebih mudah ...” (respondent A1)

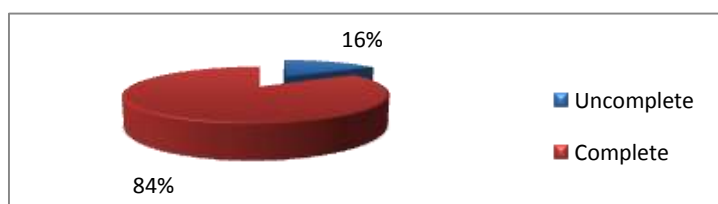


Figure 3. Order entry record completeness in CPOE system at GMC Health Center by 26th-31st July 2010

The result demonstrates overall end-users have agreed that the CPOE application system has to support the needs of the existing workflow process. It proved from the normal service time required by using the application. It showed 70% of end-users expressed their perceived of usefulness. Perceived of ease of use with CPOE application system showed 93% of patient data which entered by physician had complete as patient medical records.

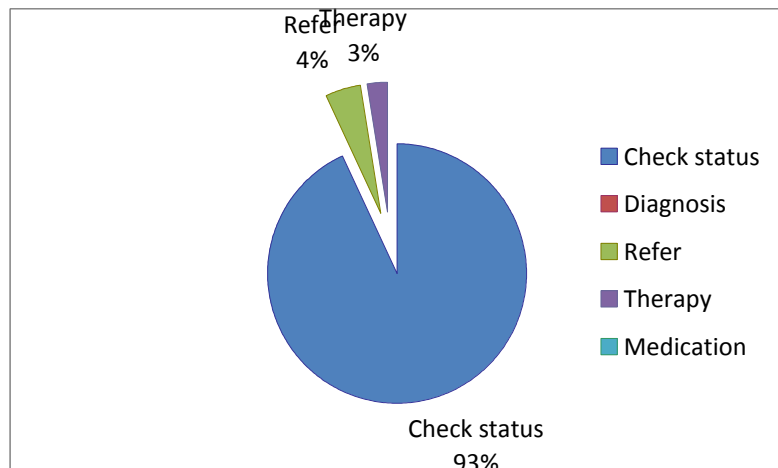


Figure 4. Persen of blank column which entered in CPOE system at GMC Health Center by 26th-31st July 2010

Most of physician (45%) was entered patient data into the CPOE system while doing anamnesis directly, than the other (25%) was entered the data with the patient out after. There are only 30% end-user was entered patient data by adjusting the condition of the patient when getting medical care. The result showed that bias can be avoided, compared to manually recorded data, when patients have to face very much lined up to be served.

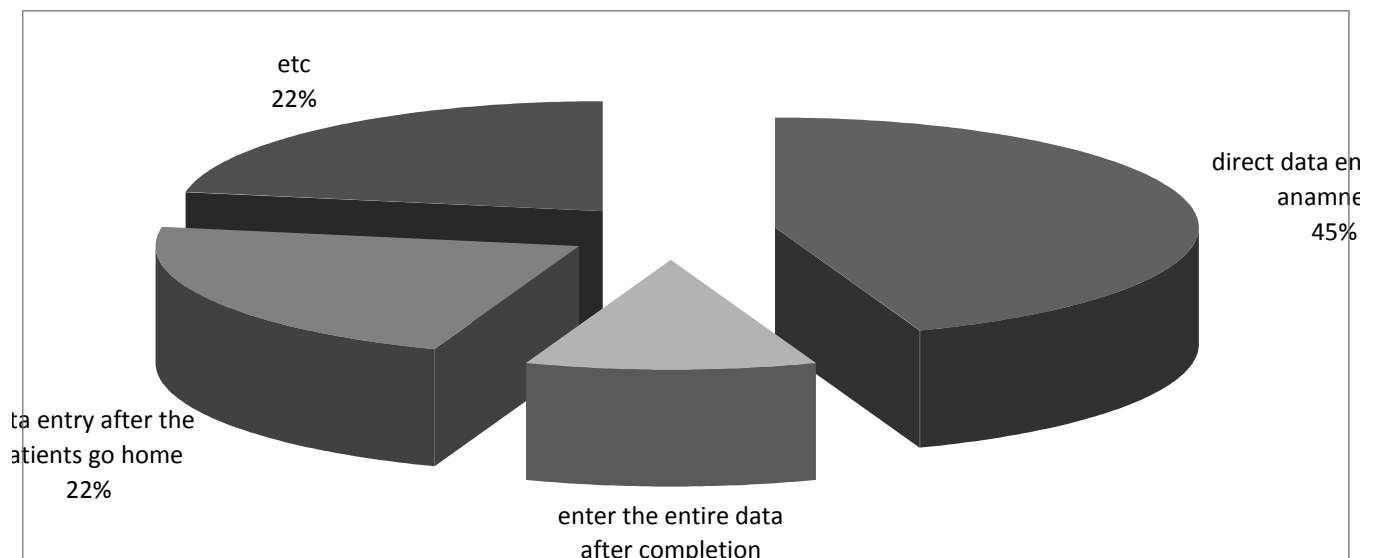


Figure 5. Order entry behavior in CPOE system at GMC Health Center

The existence of encryption system enables the end-user log-on and guarantees to restrict from another un-interested person. It is also much less scattered than when the data are recorded on paper. Physician has privilege to access the features menu which is

available in applications that can not be seen another privileges. Data security aspect, in addition to storage, is securing the management of patient medical records efficiently.

However, relies on electricity power infrastructure makes the CPOE system obstacle when it goes out or the lack of other resources. As a result, the service process will be disrupted. In addition, physician can not entry patient data into the CPOE system, which is making the physician do not know about the past history of patient medication consequently. It implies to occur of inappropriate treatment vulnerability.

d. Decisin Making Process and Error Prescribing

The correlation between the diagnoses of the disease exists with prescribed drug therapy is seen that the use of doses of the drug prescribing pattern has the possibility of prescribing errors.

Tabel 1. Drug amount by drug therapy classes in GMC Health Center

DRUG THERAPY CLASSES	AMOUNT (TABLETS)
Antibiotik	1702
Analgetik-antipiretik	1291
Multivitamin	1116
Anti influenza	879
Anti inflamasi (SAID)	703
Anti histamin	627
Analgesik-Anti inflamasi (NSAID)	562
Anti emetik	540
Anti diabetik	416

On therapy process rationally, there are several things to consider in drug prescribing to patients. It is not only effectiveness or drug availability (practically and inexpensive) for drug utilization to patient, but also it needs to appropriate the drug doses for patient safety (Priyanto, 2009).

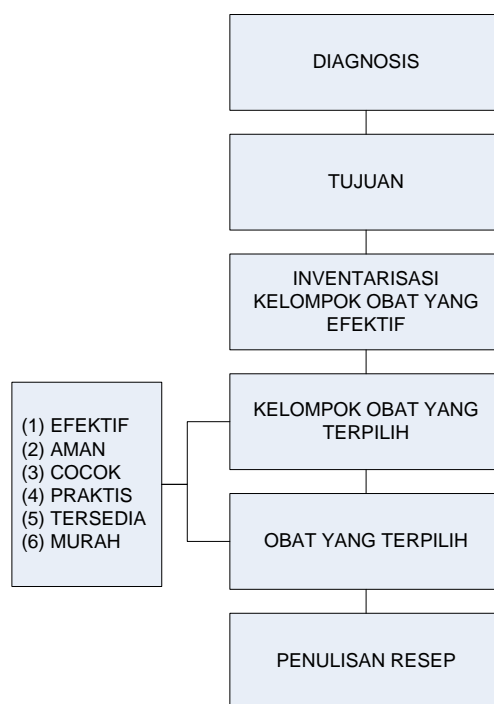


Figure 6. Drug therapy process rationally

The excess of use of Steroids Anti Inflammatory Drug (SAID) class of corticosteroids can cause side effects to increase blood pressure. It prescribes 75,67% of total therapy in patients in GMC Health Center, shows a very significant concern will occurrence of potential adverse drug events. Moreover, it relevancies with patient contraindication to primary hypertension that showed the fifth as the highest ranked in the GMC Health Center therapy treatment.

In case of antibiotic utilization shows the relevance of the diagnosis occurred descriptively, it showed less antibiotic prescribing. The ratio of antibiotic prescribing on the entire bacterial diagnosis was 21,33%, or around 4-5 tablets of antibiotics by patient. This treatment was giving antibiotics therapy only to supply an average of 1-2 days by patient. While prescribing antibiotics less than three days, did not adequately against disease-caused by bacteria. It indicates that the problem of treatment failure, due to toxicity and resistance, can occur as part of a medication error, while for more than 60 years the use of inappropriate antimicrobial prescribing reach 50%, become huge and settled problem on antimicrobials utilization (Priyanto, 2009).

Drug prescription as treatment to patient is complexity problem related. The increases of drug types is one of all caused, such as alone or in combination. Drug combinations often lead to difficulties for individual doses established. It enables to interact and is considered as better than a single drug (Priyanto, 2009). Therefore, these trends become potential events or preventable adverse drug events related to medication errors in health care facilities.

CONCLUSION

A decade implementation guarantees the user's perception be able to understand with ease and usefulness of the CPOE system. However, it stills no guarantees for the implementation of CPOE systems to prevent error prescription (ADES). CPOE implementation has yet demonstrated a significant development. Existing applications have some negative impact on doctor-patient communication. In addition, the system merely replaces the role of the paper which loaded into the computer (paperless). It is also can not support the decision, either by presenting ther warning as impact of inapproprate drug uses (alerts system), or in making the outcome present directly (real-time) to unit ordered. Further study needs to analysis the CPOE systems on decision-making as impact to information which related to patient safety.

REFERENCES

- ASH, J. S., GORMAN, P. N. & HERSH, W. R. 1998. Physician order entry in U.S. hospitals. *Proc AMIA Symp*, 235-9.
- ASH, J. S., SITTING, D. F., CAMPBELL, E., GUAPPONE, K. & DYKSTRA, R. H. 2006. An unintended consequence of CPOE implementation: shifts in power, control, and autonomy. *AMIA Annu Symp Proc*, 11-5.
- BATTLES, J. B. & LILFORD, R. J. 2003. Organizing patient safety research to identify risks and hazards. *Qual Saf Health Care*, 12 Suppl 2, ii2-7.
- BERGER, R. G. & KICHAK, J. P. 2004. Computerized physician order entry: helpful or harmful? *J Am Med Inform Assoc*, 11, 100-3.
- CALLEN, J. L., WESTBROOK, J. I. & BRAITHWAITE, J. 2006. The Effect of Physicians' Long-term Use of CPOE on Their Test Management Work Practices. *J Am Med Inform Assoc*, 13, 643-52.
- CAMPBELL, E. M., GUAPPONE, K. P., SITTING, D. F., DYKSTRA, R. H. & ASH, J. S. 2009. Computerized Provider Order Entry Adoption: Implications for Clinical Workflow. *J Gen Intern Med*, 24, 21-6.
- COLPAERT, K., CLAUS, B., SOMERS, A., VANDEWOUDE, K., ROBAYS, H. & DECRUYENAERE, J. 2006. Impact of computerized physician order entry on medication prescription errors in the intensive care unit: a controlled cross-sectional trial. *Crit Care*, 10, R21.
- DEVINE, E. B., HANSEN, R. N., WILSON-NORTON, J. L., LAWLESS, N. M., FISK, A. W., BLOUGH, D. K., MARTIN, D. P. & SULLIVAN, S. D. 2010. The impact of computerized provider order entry on medication errors in a multispecialty group practice. *J Am Med Inform Assoc*, 17, 78-84.
- GALANTER, W. L., DIDOMENICO, R. J. & POLIKAITIS, A. 2005. A trial of automated decision support alerts for contraindicated medications using computerized physician order entry. *J Am Med Inform Assoc*, 12, 269-74.
- KAUSHAL, R., SHOJANIA, K. G. & BATES, D. W. 2003. Effects of computerized physician order entry and clinical decision support systems on medication safety: a systematic review. *Arch Intern Med*, 163, 1409-16.

- KUPERMAN, G. J., BOBB, A., PAYNE, T. H., AVERY, A. J., GANDHI, T. K., BURNS, G., CLASSEN, D. C. & BATES, D. W. 2007. Medication-related clinical decision support in computerized provider order entry systems: a review. *J Am Med Inform Assoc*, 14, 29-40.
- NIAZKHANI, Z., PIRNEJAD, H., BERG, M. & AARTS, J. 2009. The Impact of Computerized Provider Order Entry Systems on Inpatient Clinical Workflow: A Literature Review. *J Am Med Inform Assoc*, 16, 539-49.
- POON, E. G., BLUMENTHAL, D., JAGGI, T., HONOUR, M. M., BATES, D. W. & KAUSHAL, R. 2004. Overcoming barriers to adopting and implementing computerized physician order entry systems in U.S. hospitals. *Health Aff (Millwood)*, 23, 184-90.
- PRIYANTO 2009. *Farmakoterapi dan Terminologi Medis*, Depok, Lembaga Studi dan Konsultasi Farmakologi (Leskonfi).
- SCHAUBHUT, R. M. & JONES, C. 2000. A systems approach to medication error reduction. *J Nurs Care Qual*, 14, 13-27.
- SCHEDLBAUER, A., PRASAD, V., MULVANEY, C., PHANSALKAR, S., STANTON, W., BATES, D. W. & AVERY, A. J. 2009. What evidence supports the use of computerized alerts and prompts to improve clinicians' prescribing behavior? *J Am Med Inform Assoc*, 16, 531-8.
- WESS, M. L., EMBI, P. J., BESIER, J. L., LOWRY, C. H., ANDERSON, P. F., BESIER, J. C., THELEN, G. & HEGNER, C. 2007. Effect of a Computerized Provider Order Entry (CPOE) System on Medication Orders at a Community Hospital and University Hospital. *AMIA Annu Symp Proc*, 2007, 796-800.