

Rethinking the Hospital Pharmacist Service: Centralized Logistics–ICT Systems and Clinical Pharmaceutical Care Strategies as a Management Opportunity for Public and Private Institutions



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Submission: September 04, 2017; Published: November 14, 2017

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Abstract

In this research article we give some useful instruments to adequately manage hospital pharmaceutical service with a rational use of drugs and medical devices. We have seen also that using new ICT instruments and CENTRALIZED LOGISTICS we can change the hospital pharmacist main focus and translate from logistic to more clinical functions' strategy named CLINICAL PHARMACEUTICAL CARE add the management strategy in clinical pharmacy setting since single patient need. In this work we also show as a practical ICT experience (EMERGENCY HOSPITAL DRUG CABINET SYSTEMS) can be translated to many hospitals setting with specific advantages.

Keywords: Change management; Hospital pharmacy; Innovation; Strategy; Healthcare; Pharmaceutical care and Clinical pharmacy; Logistics; Medical error; Clinical outcomes.

Introduction

In last year's healthcare costs are increased constantly in logarithmic way and this conditions need a high efficient resource management system more than past. Drugs, medical devices, diagnostics or medical errors are relevant voice in the public and private hospital current budget and healthcare Institution and government try every day to control it. (U.S. HEALTH national expenditure amounted total 3.0-3 billion U.S.D. The total spending on medicine in the USA was about 6 more than 400 us dollars in 2015). A high performance HEALTHCARE org Need today: deep innovations, right management of materials (LOGISTICS drugs and medical devices use), new technologies knowledge, risk management skills and other resource. Strategic, change, knowledge management approach, sharing economy philosophy and other new instruments as velocity management [1] gives improving the global results. (Economic but also clinical). Also Multi-professional medical equipment with permanent presence of the clinical pharmacists give improving in global results (clinical-economic outcomes) [2].

Risk management reduces total costs due by therapy and other kind of error and gives solution to related problems in

preventive and proactive way. The clinical pharmacists complete the patient medical team Adding deep pharmaceutical and pharmacological competencies (To prevent ADR, therapy errors, and monitoring the PHARMACOLOGICAL therapy) resulting in more containing in medical error.

An efficacy HR management gives high contributed in the TOTAL results. [3] make possible rapid introduction of the different healthcare professionals in EQUIPMENT But Today we have also a powerful instrument to efficacy control the costs to be used: centralized logistics systems (to reduce GLOBAL costs of drugs and medical device). The centralized logistic (and regional buying center) make possible a great rationalization in costs and in hospital pharmacy working time.

This system Increase the amount of orders (Cumulative way) and this make possible to have more discount in drug prices by pharmaceutical industries. The ordering by the different hospital linked and associated in this way this contribute to containing total costs more versus without this strategy. Moreover, this make possible reduce hospital pharmacy stokes (immobilized drugs costs, less expiration data problems) giving the same time continuity to the therapy to the hospital wards in safety way.

This systems need a just in time systems and a great support by ICT (healthcare professionals with informatics and data management knowledge). The rapid communication with the hub and spoke make possible to have the drugs in strictly time. (We can think to save life drugs especially). The hospital pharmacist clinical competences give the correct priority (in ordering procedure) and this is a crucial fact in the global management of the systems. With centralized logistic need a small stoke of drugs in the hospital pharmacy whit 60-80 kind of molecules (critical medical devices and drugs) and an emergency ICU Drugs Cabinets to cover emergencies (if not ACTIVE an 24h hospital pharmacist service). The great amount of drugs and medical devices are stoked in central ware house.

This approach needs high expertise by the clinical hospital pharmacist to rationalize the systems without error: right classification of critical drugs and an efficacy risk management system to prevent dis- functions (root cause analysis, FMEA approach, total quality management and other strategy). We can say that the clinical pharmacists works must be an edge between ward the hospital pharmacy and the hub. (ICT mediated). Other instrument to manage at the right level can be Dose unit drug systems, inforatized prescription with applied software, oncologic unit's sterile robot, emergency drugs cabinet systems and some other. All this rationalize the hospital global request of drugs and med devices but also reduce in high way therapy error. ICT technologies provide security system to transfer patient and other data. The total knowledge is increased using these ICT systems. (Biomedical database for prevent interactions, contraindications and other). But what is relevant in this new process is the active role of hospital clinical pharmacist in more consultant activity versus the classic logistic Functions. (A cultural changes) from the classic logistic function towards more clinical new pharmaceutical consultant functions. This make possible in the same time to adequately monitoring the healthcare costs (drugs and medical devices) containing medical and therapy error, improving also the clinical outcomes [2].

The application of clinical pharmacist presence in stabile way in medical team results in about 35% cost reduction (drugs, medical devices), costs due by medical errors, reducing recovery days. In example, an Italian practical experience: health ministerial project: "Ward clinical pharmacists in oncology"⁵. A collaboration of: SIFO (Italian Society Hospital Pharmacy), Italian Federation of professional Pharmacists' Orders, Italian association of Medical Oncology), EAHP (European Association of Hospital Pharmacist), a multi-center experience involving 5 public hospitals with the presence of clinical pharmacists in the oncology wards. The result was a reduction of ward drug and MD stokes from 32% to 88% and 30% less of drugs therapy errors [4].

Related to these results the managerial competences and skills and knowledge of the clinical pharmacist are often requested by general manager office and by physicians director of the many discipline to monitoring and control the global

buying systems [3]. Antimicrobial stewardship [4], medical Gases pharmacy management, high cost drugs management, medical devices high competencies, Toxicological equip with hospital pharmacists presence, oncology lab, ICU, nutrition team service, pain management medical equip, and other involving clinical pharmacist create an high synergy.

Other relevant role can be played in surgery field [5] nephrology, heart disease and many others. In ex the total cost for innovative drug therapy is under a high increase (therapy of hepatitis c), antimicrobials meet great resistance, oncology therapy do not present equal efficacy towards all neoplastic tissue the same. "The economic aspect is relevant on cost of drugs and payment by government and institution or insurance. (In example 35.000 euro/USD/ patient for some biological MABS). Even ministries of health in some countries (ITALY) not pay all some new innovative drugs but use a system that verify the results obtained. (Payment by results or risk sharing et other procedure)" [4]. This problems need a deep and continuous high activity by clinical pharmacist to create a more rational decision making systems in today therapy world.

Material and Methods

In this observational and research work we report some relevant publications (in our opinion) involved in this change and related to the results we have find we submit to healthcare institution a new systems to efficacy control and reduce the healthcare costs improving clinical outcomes. We observe the hospital pharmacy organization in different countries in order to verify the organizational way of works. We describe also a practical research experience involved in management of emergency drug in hospital setting [6]. Then after this research we analyze the total costs involved in this kind of organization change and the advantages that can be obtained.

Results

Observing the hospital pharmacy organization in many countries we can say that the pharmacy services are more oriented to the classic function as logistic, galenic lab, nutrition lab, dispensing activities and other. But only few hospital pharmacy services are highly oriented to advanced clinical function as advanced center usually do. The same the university courses involved in hospital pharmacy are more focused on the classic pharmacist function and only in recent decades towards more clinical Functions. (Only few cases really involved in improving the clinical outcomes in medical team and not only with monitoring tasks). Also technology applications are not equally available to all hospital places. (Small-large hospitals, rural or city et other).

From literature we have find this results: "During 1930 to 2016 a progressive development of clinical pharmacy and pharmaceutical care was developed. We have observed a "general positive influence of the pharmacist's presence as a part of the medical equip, on public health in various clinical

outcomes"; this according to systematic reviews, clinical trials and meta-analysis" [7]. The model of clinical pharmacy practice adopted by many pharmacy department hospitals is no longer appropriate for the demands of today's health-care services.

Reviews many new models proposed for clinical pharmacy practice including an integrated model for providing a pharmaceutical care management approach in the health-care system. This model is a response to the failures of traditional drug and pharmacological therapy. It is an idea about how health professionals should integrate their professional work to obtain clinical outcomes important to patients and clinicians" [8].

"Hospital information system is widely used to improve work efficiency of hospitals in China. A novel clinical pharmacy management system developed by our hospital was introduced to improve the work efficiency of clinical pharmacists in our hospital, to carry out large sample statistical analyzes by providing pharmacy information services and promoting rational pharmacological drug use. Clinical pharmacy management system was developed according to the actual situation.

Taking prescription review in the department of general surgery as the example, work efficiency of clinical pharmacists, quality and qualified rates of prescriptions before and after utilizing clinical pharmacy management system were compared. Statistics of 48,562 outpatient and 5776 inpatient prescriptions of the general surgical department were analyzed. Qualified rates of both the inpatient and outpatient prescriptions of the general surgery department increased, and the use of antibiotics decreased. This system apparently improved work efficiency standardized the level and accuracy of drug use, which will improve the rational drug use and pharmacy information service in our hospital. Meanwhile, utilization of prophylactic antibiotics for the aseptic operations also reduced" [9]. "We submit to the scientific community "Clinical Pharmaceutical Care" as a new discipline, intended to improve clinical and economic endpoint in pharmacological therapy reducing pharmacological therapy errors and with a more rational application of resource in medical equipment. This new approach takes advantages using Managerial and ICT principles. Core training must include principles of Management, ICT new Professional social media, psychological behavior and other skills for team working added to be added to the classic clinical pharmacy programs.

Theory and practical applications help: the knowledge in field of medical lab and imaging give great advantages in this field for the hard relationship with much drug therapy. We strongly ask to public institution to apply this discipline to obtain the right rational drug therapies and rational method to use the clinical pharmacist resource [10]. "Based on the results of this study, the observed achievements were due to medical lab and imaging knowledge of the clinical pharmacist, as part of the equipment in a hospital setting. Such imaging and medical laboratory expertise of the clinical pharmacist has resulted in a significant impact on therapy.

For patients' safety and health and cost reduction and for clinical pharmaceutical care purposes, it is incumbent upon the hospitals to engage and demand an active role from hospital pharmacists, especially in fields such as medical Lab and imaging. Isn't time for the health authorities, to utilize the expertise of hospital pharmacists when, it comes to the reduction the patients' life threatening risks, enhancing clinical patients outcomes as well as cost savings, when there is such an exponential rise of the innovative treatments prices? [11] to obtain more efficient results in improving some clinical outcomes the clinical pharmacist must have an expert skill in the field of psychological and behavior aspects to use a practical settings when member of medical team.

Participation that must be at the high level required, with autonomy and independence. This to give the right response to DRP that a rational PHARMACOLOGICAL therapy requires. There is a need to increase the ability of clinical ph in providing ph care in medical team and in diagnostics for its relationship in monitoring of drugs therapy. Rotations in different wards provide a good experience. So we ask to international organization and university to include the kind of course in university curriculum of students that will be applied in ph Care works. This skill is useful in pharmacists-patients relationship in order to have high patient's compliance level [12].

Reduction of medication therapy errors is needed and demanded by: patients, health authorities, government, insurances companies. "Multiprofessional healthcare team is the right way of work in health care systems. A WARD clinical pharmacist today contributes in many fields: hematology oncology, toxicology, infectious diseases, emergency medical, nephrology, nutrition pharmacy service, pain management and others" [8]. The clinical endpoints depend also by the medical device used and pharmacist specialist represents a great resource in cost containment in every level (to use the right one in every different situation) in this specific use. Pharmacy care principles can correctly be applied in the Medical devices dedicated to the single patient. Consultant activity in properties, classification, legislation, Alternative products, logistic are the working filed in which hospital pharmacist play a relevant roles in medical equipment" [13]. "The innovation introduced with biomedical databases and searching engine motors improved research works with rapid ways in all kind of scientific areas Internet and professional social media have brought a great development in rapidly connecting with professionals. The researchers in last 3 decades has been great possibility to share their practical experience more than past with improving results.

They are playing a crucial and relevant role today working field through this rapid development. LinkedIn, Slide share, Research gate, Pub Med, YouTube NCBI, Face book, and other etc. The possibility to create new bridge researchers; with similar interests, discipline with more rapid development, never seen in last 3 decades" [14].

"In ICU we can see reduction in mortality rate when pharmacist takes really part of the equipment "[9] "Clinical Ph care required more use also of social media to meet researcher in more efficient way. In the same time clinical pharmacist can be a scientific edge between professional in therapy filed. PH care management can be useful tools to have more rational therapy systems. Drugs are registered for specifically indication, and at the same time every drug to be a rational therapy need a rational decision making system that require a multidisciplinary equipment that can cover all aspect of Pharmaceutical and pharmacological molecular metabolism (also kinetics and Pharmacodynamics) this have great possibility for clinical pharmacist but it must increase expertise in field of diagnostic (lab medicine and imaging) for the high relationship whit pharmacological drug therapy.

The old algorithm was "physicians-patients- classic pharmacist and drugs "today it must be "patient physicians-clinical pharmacists (As consultant) and drug [15] "Physicians alone cannot cover all aspect of the pharmacological treatment (for example in the field of drug therapy monitoring, interactions, adverse drug reaction ADR, toxicology, novel delivery systems, immune globulin-based) therapeutics and other innovative drugs and medical devices systems, which have their pharmaceutical specific worlds. This article likes to improve the ph. care application in countries with an advanced healthcare system to provide more rational drug therapy to patients.

When not possible, it would be a good idea using ph. care, in particular populations such as: severe disease, critically ill, patients with multiple illnesses, transplants, immunosuppressant, oncology or other serious conditions, at least when the treatments cost a lot" [2].

Using sharing economy instruments we can reduce healthcare costs about 38-40% and obtain these results in more rapid way. The results obtained with sharing economy time can be applied in healthcare: sharing of knowledge "ICT systems can reduce errors and waste materials, rotation drugs and medical devices stoke and reducing costs: Dose unit systems and programs reduce costs about 10-15% and ward clinical pharmacist presence in stabile way in medical team can reduce cost about 25-30%" [8]. In a lancet infection disease meta-analysis was reported" Our findings of beneficial effects on outcomes with nine antimicrobial stewardship objectives suggest they can guide stewardship teams in their efforts to improve the quality of antibiotic use in hospitals "[16].

According to last editorial The Clinical Pharmacists Main Focus. J Appl Pharm 9: e114 we can see that one of the main focus of the clinical pharmacist "must be applied in priority way to the most critical patients in order to achieve the best results available [9]. In this condition even benefit of 1 life achieved in mortality rate is a real golden endpoint (we can think for example to a pediatric poisoning, or severe infectious disease in pregnancy or the effect of inefficacy immunosuppressive therapy in transplanted et other) [12].

This can be considered in example as a reduction in NNT to improve a therapeutic strategy" [17]. We have also see in some practical experience that the introduce in daily works of some technologies make possible a right management (reducing total costs and with safety) in example in emergency drug cabinet systems [6] "no near miss event or other patient risk or even fatal event was observed and was covered the emergency need of drugs in the 99% of cases, and only 1 time was necessary the central pharmacy call." (The same results we have observed during One year), we can have also a reduction in total costs providing an efficacy system. (About 50.000 euro in 5 years in an Italian public hospital 700 beds) [6].

Other ICT instruments are in examples dose unit system to provide single Unit of drugs (preventing waste or expiration of pharmacological therapies- full therapy traceability), informatics prescription software (to detect interactions, allergy, and toxicity), Informatics management of narcotic drugs or antidotes for right logistics and other.

Discussion

Analyzing the literature reported in this work and the results of a specific practical experience [6] we can say that using drugs central logistics (hub and spoke pharmacy system) added to ICT instrument and clinical pharmaceutical care and a more clinical pharmacy approach we can have reduced costs about 40%. This result not only due by drugs and medical devices costs rationalized but also by the reducing of medical errors, days of recovery and especially by improving clinical outcomes.

In example the costs for an expensive transplant can be lost easy if not applied efficacy pharmacological drug therapy. (The same thinking about complex cardiac surgery or other critical and expensive patient's situation). The pharmacist competences/skills added to ADVANCED ICT INSTRUMENTS can improve the global clinical results. This is the reason to shift from the classic logistic competences and skills of clinical pharmacist towards more and deep clinical tasks and to make an intensive ICT use as requested today.

Conclusion

We think that this kind of change in pharmaceutical dep. is today needed and this shift of hospital pharmacist competence from the classic logistic roles towards more clinical/economic management tasks gives reduction of 35-40% in healthcare total costs. The application of clinical pharmacist to strictly control the prescription of drugs an Medical derives according protocols, guidelines, central-local rules) make possible an great appropriateness verify. We think that the efficacy instruments to the clinical pharmacist and healthcare institution to manage healthcare costs can be:

- a. Management principles and TQM
- b. Clinical Pharmaceutical care (new health care discipline) [18]

- c. ICT technologies
- d. Sharing economy principles of applications

The total costs involved in this change in working activities of hospital pharmacist are included in the costs rationalized by this new management system [19]. (We can say that is not a cost but a resource). Pharmacy must be considered not only like a definite physical place but a complex world where the consultant clinical activities can make the difference in patient outcomes (clinical, economic, and quality of life) [20-26]. The core process must be a rethinking in hospital pharmacy competences enhancing the clinical competences level and time dedicated to this specific tasks.

This kind of process must involve politics stakeholders institution, healthcare org, decision making hospital general managers, universities and the same all healthcare Professional. The principal goal is obtained if this change is accepted by all the actors and professionals involved in healthcare management agree with this new approach. But is crucial that the same hospital pharmacist know that in this new organization system other specific kind of responsibility are involved in direct patient clinical pharmacy and pharmaceutical care works. The experiences we have see [27-30] can be usefully transferred to other hospital and other situations giving good results.

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DOI: [10.19080/GJPPS.2017.03.555625](https://doi.org/10.19080/GJPPS.2017.03.555625)

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