Chapter 1

Pharmacoinformatics:
Advanced Information Systems for Improved Pharmaceutical Care

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ABSTRACT

Healthcare organizations are facing serious internal and external challenges that affect their ability to provide quality pharmaceutical care and maintain patient safety. The dynamics of such challenges are affecting pharmaceutical processes, organizational and operating efficiencies, and patient outcomes. Pharmacoinformatics has been used as a term to reflect upon the use of information system technologies in the improvement of pharmaceutical care. However, despite its growing importance, it has been deployed in a limited scale. This chapter sheds light on the context of pharmacoinformatics, its conceptualization within the domain of decision support tools, and its role in the improvement of pharmaceutical care.

INTRODUCTION

The healthcare sector is witnessing tremendous transformations in response to different internal challenges and external agents of change that significantly affect its resource bases, configurations, and processes. Internal (system-based) challenges include the failure to address healthcare inequali-

ties, manage the growing demand for healthcare services, achieve significant patient-oriented safety outcomes, and improve the effectiveness and efficiency of processes. Externally-induced challenges originate from changes in external settings that affect the capacity of the entire healthcare sector to function. Demographic and mobility trends, occupational and economic dynamics, and the complication of disease management processes due to environmental changes, are examples of

such changes. While a wide range of factors interact to shape this context, the main reasons for problems in healthcare settings include the lack of management information, lack of clear healthcare mandates, inappropriate engagement, and involvement of decision partners and stakeholders, lack of strategic vision, lack of good governance and the failure to optimize resources.

Within this context, the question of pharmaceutical care and the provision of quality services are moved to the front line agenda of policy makers in the healthcare sector in response to the escalation of practice-based and patient-specific drug-related problems. Practice-based problems include inappropriate drug selection and choice by the physician (in terms of type, dosage, frequency, and duration of therapy), drug interactions (mainly 'drug-drug' and 'drug-disease' interactions and adverse drug events), drugs without indication or indication without drug, and prescribing without the use of relevant lab tests (e.g. renal and hepatic tests) that may that significantly affect the pharmacokinetics and pharmaco-dynamics of the drug therapy. Practice-based complications may also originate from the lack of effective communication among healthcare professionals (at the level of the entire healthcare organization such as hospitals) as well as between healthcare professionals and patients. On the other hand, patient-specific complications may be due to the inappropriate management of their medications, especially in the community setting (e.g. over/under dosage, using drugs prescribed for other patients, continuing to use drugs without prescription, and the failure to purchase drugs due to financial constraints).

The basic aim of this chapter is to investigate the context of how pharmacoinformatics contributes to the improvement of pharmaceutical care processes and pharmacy management. Special emphasis will be made on the definition of this term as well as its applications, technologies, and factors for critical success.

PHARMACY MANAGEMENT AND PHARMACEUTICAL CARE

Pharmacy management is concerned with the planning, organizing, staffing, directing and controlling of pharmacy-related functions and processes in pursuit of improved pharmaceutical care services in a complex cause-effect environment. The drivers of pharmacy management are inclusive of the multiplicity of decisions to be taken, the interplay of change agents inside healthcare organizations, and the dynamics of interaction between the entire healthcare organization and its surrounding environment. Pharmacy management involves a wide range of functions that closely address patient safety, supply chain management, and drug affordability using innovative approaches for drug management and technology utilization particularly under the needs resulting from complex care. Pharmaceutical care processes are directed towards the analysis and solving of drug-related problems. Such processes involve identifying, solving, and preventing potential or actual Drug-Related Problems (DRPs) with regards to a patient's drug therapy (Westerlund, et al., 1999; ASHP, 1993) by helping (Westerlund, Almarsdóttir, & Melander, 1999) patients to make the best use of their medication. DRPs can be easily understood as events or circumstances involving drug therapies that can actually or potentially interfere with the desired health outcome for patients (van Mil, et al., 2004; PCNE, 2011). DRPs can be categorized into problems and causes, and are related to factors such as drug choices, doses, interactions, adverse drug events due to drug administration, medical errors of omission, and patient-related factors (PCNE, 2011; Anderson, 2011). Supply chain management processes are concerned with the planning and monitoring of the availability, affordability, and usage of drugs. In addition to stock control and drug tracking, supply chain functions are concerned with the

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