

# Control of intravenous medication wastage at a teaching hospital in Saudi Arabia

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## ABSTRACT

**الأهداف:** دراسة ظاهرة إهدار وعدم استخدام الأدوية الوريدية للمرضى المنومين وتحديد العوامل المسببة لهذه الظاهرة، بالإضافة إلى اقتراح برنامج توعوي للحد من هذه الظاهرة اعتماداً على نتائج هذه الدراسة.

**الطريقة:** أُجريت هذه الدراسة في مستشفى الملك خالد التعليمي التابع لجامعة الملك سعود، الرياض، المملكة العربية السعودية وقد استغرقت الدراسة شهراً واحداً من سبتمبر إلى أكتوبر 2009م. لقد قمنا بالمراقبة اليومية لظاهرة إرجاع الأدوية الوريدية من الأجنحة إلى الصيدلية ومن ثم جمع البيانات وتحليلها، وبناءً على ذلك تم تقييم كل حالة على حدة وتحديد أسباب هذه المشكلة.

**النتائج:** لقد قمنا بجمع 265 دواءً وريدياً لم يُعطى للمرضى وتم إرجاعه إلى الصيدلية. وأشارت النتائج إلى أن المحاليل الوريدية التي تحتوي على مضادات حيوية كانت أكثر الأصناف إهداراً وذلك بنسبة (77%). وكان الانقطاع عن الدواء من أهم العوامل المسببة لهذه الظاهرة (60%).

**خاتمة:** أثبتت هذه الدراسة ظاهرة إهدار الأدوية الوريدية وعدم استخدامها من قبل مرضى العيادات الداخلية، وقد تم تحديد المسببات الرئيسية لهذه الظاهرة وبناءً على دلالات الدراسة تم اقتراح برنامج توعوي لحل هذه المشكلة. نحن بحاجة للمزيد من الدراسات التي تمتد لفترات أطول حول هذا الموضوع، ويجب أن يتبع ذلك تحليلاً مفصلاً لنتائج تطبيق البرنامج التوعوي المقترح.

**Objectives:** To investigate the intravenous (IV) medication wastage within the inpatient pharmacy services at a teaching hospital, and to highlight the main causes for such waste and propose a policy to minimize wastage based on the study findings.

**Methods:** For a one month period starting from September until October 2009, the returned and unused IV medications to the inpatient pharmacy in a teaching hospital at King Khalid University Hospital of King Saud University, Riyadh, Kingdom of Saudi Arabia were observed daily. Data were

collected and evaluated. The causes of this problem were analyzed.

**Results:** Approximately 265 items of IV medication were collected during the study period. Antibiotics preparations (77%) were the most unused and wasted. Medication discontinuation (60%) was the main cause for such wastage.

**Conclusion:** The problem of IV medication wastage was noticed and investigated. The main causes of such problems were specified, and a program to minimize the wastage was proposed. Further study with more data for longer time is required, followed by an evaluation of the impact of applying the proposed program.

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The wastage of medicines is considered to be a problematic issue in the health care system. How to save medication wastages need some techniques and methodologies to be adapted.<sup>1</sup> As shown in the literature, the total national costs due to medication wastage would not be less than 1\$ billion per year in the United States.<sup>2</sup> Drug wastage has been reported as one of the most important causes of escalation of health care costs and pharmaceutical consumption in Canada.<sup>3</sup> The value of unused medicines in the United Kingdom was estimated to be approximately 38 million per year.<sup>4,5</sup> Also, drug wastage represented a significant portion of the entire anesthesia drug budget in the USA.<sup>6</sup> The outpatient medications wastage in these articles was

estimated in terms of the amount of drug products and their costs. Similar study was conducted in urban households in Iran, and concluded that a large percentage was being wasted.<sup>7</sup> Trial prescription programs were surveyed for outpatients in Canada, and were effective in reducing the direct cost of drug wastage.<sup>8</sup> A model for comparing unnecessary costs associated with various outpatients prescriptions fill quantity policies were examined in the Veterans Administration Chicago Health Care system.<sup>9</sup> The model was informative for determining policies for prescription fill quantities.<sup>9</sup> Intravenous (IV) administered medications for admitted patients and wastage of the medication was detected and evaluated by researchers. Different strategies were proposed to reduce wastage.<sup>10,11</sup> A program to minimize the waste of IV administered medication was implemented and evaluated, and the effectiveness was determined by calculating the drug wastage percentage of the entire budget.<sup>12</sup> Different programs followed by cost-effectiveness evaluation after implementation had shown remarkable saving in cost (\$8,044.00 annually).<sup>13</sup> A cost containment plan was evaluated to reduce drug expenditures and minimize drug waste in an Oncology ward in Italy.<sup>14</sup> In the Kingdom of Saudi Arabia (KSA) medication wastage happens on a daily basis in most of the local hospitals, but not given close attention from the hospital practicing pharmacists or the management. The pharmacy departments in most local hospitals are concerned with the excessive number of IV medication doses wasted, and the time being consumed by pharmacists to handle this problem. Most of the local research published on drug wastage was based in an outpatient populations.<sup>15,16</sup> The objectives of the study were to evaluate wastage and return of inpatient IV medications, and to assess the most common reasons for non-usage. In addition, the type, quantity, and value of all returned and wasted preparations was identified. Based on these study findings, a program will be suggested to minimize such wastage.

**Methods.** This study was performed in a tertiary university teaching hospital at King Khalid University Hospital (KKUH) with 1200 beds of King Saud University (KSU), Riyadh, KSA. Approval was obtained for the local ethics committee of King Saud University prior to the commencement of the study. The data were collected within inpatient pharmacy services over one month starting September to October 2009 during normal daily shifts. Data collection was based on daily monitoring of returns of IV medications (defined as wastage), and an accurate assessment of its costs. The details of all IV medicines returned to inpatient pharmacy department from different inpatient wards either via

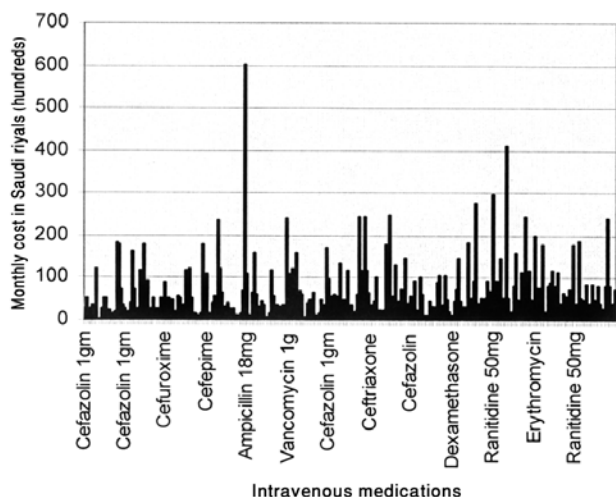
pharmacist, nurse, or porter were recorded in a data collection form designed for the study. The following information was collected: date of collection, date of dispensing, ward name or number, name of returned medicine, strength of medicine, quantity dispensed, quantity returned to pharmacy, reason for return, and cost of returned medicine. Due to the complexity and the supply process, oncology preparations and anesthetics were excluded. The reasons for wastage, costs, and types of IV medicines were analyzed.

All data gathered were statistically evaluated in terms of frequency and distribution using Predictive Analytics Software (PASW) version 18 (IBM SPSS Statistics, Somers, NY, USA).

**Results.** A total of 265 out of 1218 (21.75%) IV medicine preparations were returned to the inpatient pharmacy from different wards during the study period. All recorded reasons for return and wastage were: medication discontinuation (n=159 [60%]), switching from IV therapy to oral (n=36 [13.6%]), patient discharged (n=34 [12.4%]), delivery of extra dose to the ward (n=10 [3.8%]), refill order (n=10 [3.8%]), patient expiration (death) (n=8 [3%]), patient objection to take the dose (n=5 [1.8%]), and 1.3% (n=3) of the medicine had not been ordered. The main categories and cost of wasted IV medications were illustrated in Table 1. The estimated cost in Saudi Riyals was calculated with the help of the medical supply and pharmaceutical purchasing departments at KKUH. Examples of some intravenous preparations and their cost are shown in Figure 1. This cost only reflects the drugs or pharmaceutical products and diluents. Adding the prices for used syringes, bottles, or mini bags containing diluents, and time of pharmacists and nurses will increase the cost of wastage considerably above the value calculated here.<sup>6</sup> Including these handling and packaging cost, the total cost for wastage of IV medication in this study was SAR 28,876.62 per month. This correlates to a wastage of 4.4% of the budget allocated for the inpatient intravenous medication preparations services.

**Table 1** - Unused intravenous medication and the calculated cost.

Drug group	n	(%)	Wastage cost
Antibiotics	205	(77.0)	14,041.00
Antigastric agents	25	(9.0)	1,641.21
Steroid preparations	20	(7.5)	1,367.67
Antidiabetic agents (insulin preparation)	10	(3.7)	674.72
Antiviral agents	5	(1.8)	328.24
<b>Total</b>	<b>265</b>		<b>18,052.84</b>



**Figure 1** - Examples of intravenous medications and their monthly cost.

**Discussion.** Unused and returned IV medications to the inpatient pharmacy creates a daily problem to pharmacists and nurses. The handling and processing consume time and effort from them. In addition, it may cause unnecessary hazards to patients at times when there is only a limited number of pharmacists working, and who at the same time have to cover all other critical pharmaceutical services to the patients admitted. The quality of pharmaceutical services may be affected.<sup>10,11</sup> Several studies have shown that the wastage of IV medications was commonly noticed by practicing pharmacists.<sup>12</sup> This study shows the amount of wastage of IV medication in the daily routine of a hospital pharmacy in one month.

During the study period, 265 items were returned and thus, wasted. The antibiotics solutions (77%) made up most of the returned IV medications. The participating hospital KCUH is one of the busiest hospital in the region, as the teaching hospital belongs to one of the largest universities in the kingdom (KSU). The medical wards and surgical-intensive care units accounted for the highest return of intravenous antibiotic preparations. This finding was consistent with results reported in another study.<sup>14</sup> The main cause for IV medications wastage encountered in this study was medication discontinuation (60%). This was due to changes in the medication dosage, or to changes in the therapeutics approach due to a change of the treating physician in charge, according to the patient's response and anticipated side effects. The present study finding was consistent with previous studies.<sup>13,14</sup> The other reasons for such wastage such as switching from IV therapy to oral without prior notice, patient discharged, extra dose, refill order, patient expiration, patient objection, medication not ordered were mainly

attributed to poor communications between pharmacists and nurses. In addition, the variability in workload from one shift to another could be a reason for affecting the performance of the treating team including the physicians, pharmacists, and nurses. This finding is in agreement with a previous work.<sup>14</sup>

This study was conducted in a single teaching university institution, and the results obtained does not necessarily reflect some pattern of such problem in other regional hospitals within KSA. This limitation could be overcome in performing further studies on medication wastages, and the participation of most regional hospitals is highly encouraged.

In conclusion, the study highlighted the problem of intravenous medications wastage, which had been noticed on a daily basis by local pharmacists and nurses, but had never been investigated. Medication wastage may affect the quality of pharmaceutical services provided to patients in need, and is time consuming for the care team. After the wastage has been identified and characterized in this study, it would be important to create a program to reduce such wastage. The program needs to be practical and the change in wastage should be evaluated after implementation. The goal would be to reduce IV medications wastage. The proposal program (Intravenous Preparation Worksheet Program) suggesting measures to compound admixture for individual shifts, the standardization of the administration schedule for IV medications to admitted patient. A centralized unit supervised by clinical pharmacist manages the availability of a computerized physician order entry system, recycling of unused IV medications to another needy patient, and purchasing of pre-mixed preparations instead of individual manual preparations. Such a unit would help in facilitating further use of the returned medication, improving the communication process between pharmacy and nursing, and increasing efficient use of electronic communication in the health care system through a well-designed continuing educational program within this unit.

Further study should be conducted to better understand the problem of unused and returned IV medications, and to evaluate the potential impact of the proposed program to reduce such wastage.

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## Ethical Consent

All manuscripts reporting the results of experimental investigations involving human subjects should include a statement confirming that informed consent was obtained from each subject or subject's guardian, after receiving approval of the experimental protocol by a local human ethics committee, or institutional review board. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.