Waste Management Approaches in Hospital Organizations and an Example of Practice

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Objective: Hospital managers in the World and Turkey are under pressure of decreasing excessive operational costs and improving healthcare quality. One of the interventions that will smooth of the severity of this pressure is to manage the waste in the healthcare services. The Hospital Inpatient Waste Identification Tool (HIWIT) is one of the best application tools, which will bridge the knowledge, practice and leadership gaps in this context. The main objective of this study is to examine the waste in the hospital inpatient settings in the context of HIWIT’s 5 modules.

Methods: This study was conducted by using quantitative research methods. Research and Education Hospital of Duzce University was chosen as a sample center of this research. HIWIT, ward module, patient care module, diagnosis module, treatment module and patient module, was used to collect the data. Three healthcare personnel, June 15th, 2012 and December 31st 2012, carried out application of the modules.

Results: 27 waste types were defined and their proportions were determined. Overall waste proportions of five modules were like followed: Word Module 11.11%, Patient Module 16.50%, Patient Care Module 2.52%, Diagnosis Module 44.20% and Treatment Module 25.29%. The cost of determined using ward module only is 1.725.275 $. Healthcare-associated infections, delay in clinical care and flow delay were determined as the most important waste types in terms of clinical and patient safety for utilization of Social Security Institution (SGK).

Conclusion: It is conferred in practice that HIWIT is a handy tool in definition of waste and costing. Reimbursement agencies are the ones, which will take the most advantage of defined waste types. Four components were intended to acquire through waste study: improving performance, diminishing operational costs, shortening operational cycles and improving patient safety. After identifying the main priority areas of waste types, a financial expert or team should be utilized in understanding the financial implications of them. Diagnosis, treatment and patient care modules particularly are expected to contribute more to patient safety which is one of the four intended output components.

INTRODUCTION

Our aim is to make explicit of approaches that should be pursued to define, evaluate and remove waste. Any systematic approach that is devised methodologically for Turkish Hospitals has yet to be seen in practice. A literature review was undertaken using the most widely used databases - ULAKBIM, Google Scholar, Book Information Automation (KIBO) and Collective Catalogue (TOKAT) - in Turkey and four study (1-4). According to our knowledge, there were four studies dealing with waste in healthcare management in Turkish literature. This review which was undertaken from local standpoint expresses the knowledge accumulation comprised by published studies dealing with the subject matter in Turkey, particularly.

This subject matter should be examined with global
standpoint in order to bridge the knowledge gap. What should be understood by global standpoint is that the main texts which has been published by a competent institution or institutions and knowledge accumulation comprised by guides and standards which have been established and supported through pilot studies by leading institutions. Experts of subjects either arrange texts or it is applied to a qualified university for the process in the inquiry. A competent institution publishes texts; hence implementer units (hospitals in this case) would be eager to implement these texts.

There are certain fundamental waste management approaches that have come in to prominence in the global standpoint. Some of them encompass the whole hospital processes and as for some of them bring to the fore only of clinical quality. There are some other approaches which are based on the concept of Production Management using the Lean Service objective and which carries out assessment in the context of Facility Management but has yet to become widespread as well. It is to be useful to state the most widespread Waste Management Approaches and institutions, which support them:

1. Hospital Inpatient Waste Identification Tool (IHI: Institute for Healthcare Improvement) (5)
2. 7 or 8 Muda (Waste) Approach (Toyota Production System and Lean Service) (6)
3. Choosing Wisely (ABIM Foundation) (7)
4. Use Approach (Overuse, Underuse and Misuse Approach) (8)
5. Utilization Management (9)
6. Economic Efficiency Approach (Technical Efficiency + Allocation Efficiency)

Once upon summarizing first two approaches, we will get thorough the example of implementation.

**Hospital Inpatient Waste Identification Tool (HIWIT)** was devised by IHI. IHI is an independent not-for-profit organization and one of the institutions leading to efforts of health care improvement worldwide. IHI produces promising concepts to improve patient care services (e.g., Global Trigger Tool and Care Bundles) (10-12) and accelerates the change through going into action with these ideas. Main construct of the HIWIT is based on the concept of Lean Service. It was set by an expert team of 60 people and its pilot study carried out in two years. It was comprised of five modules - ward module, patient care module, diagnosis module, treatment module and patient module- and these could be customized in accordance with the needs and conditions of the implementer organization (5, 13).

Every module had a worksheet and instructions. Instructions guide to implementation of the module and explain the statements that were not understood.

**7 or 8 Muda Approach:** First waste classification (taxonomy) was done by Taiichi Ohno. Ohno identified the 7 waste types considering production (14). He developed various approaches in accordance with the processes which “add value”, “do not” and “need to be done but non-value adding”. Then, some authors adapted this 7 waste types approach to healthcare sector (15-17). Recently, some studies whose title includes 8 wastes attract attention (20-22). According to Ohno 7 Muda comprised by the wastes caused by Overproduction, Waiting, Transportation, Excessive (Over) Processing, Inventory, Motion and Defective Production (18). Employees of the Toyota Production System coined the Waste Management Science as “Wasteology” (19).

What is the subject of eighth waste is controversial and still needs to be made clear (20-21). Waste resulting from non-used employee talent potential was considered as eighth waste type by Liker (22). Redundant actions i.e. wastes are defined using the term of “3M” in Lean Production. The term of “3M” are made up of the capital letters of three words starting with the letter of M. These are categorized respectively as “Muda”, “Muri” and “Mura” and Muda means waste, Muri means excessive load and Mura means disorder and inconsistency. Mura and Muri constitutes of Muda’s primary source (23-25). Excessive load, disorder and inconsistency have the potential to engender waste in Lean Production.

**MATERIAL-METHODS**

This study was conducted using quantitative research methods. Convenience Sampling Method, which is one of the Non-Probability Sampling Methods, was utilized as sampling method. Universe of the research was the whole hospitals in one province (Duzce). Nevertheless, because of considering it’s representative power, Research and Education Hospital of Duzce University, the sole institution giving permission, (it was not possible to gain permission from other public institutions) was taken as sample. HIWIT which was developed by IHI and whose parameters could be changed according to hospitals applied was used and all the five modules mentioned above were included in collecting data.

Application of the whole modules was carried out by three healthcare personnel between June 15th, 2012 and December 31st, 2012. **Ward module** was applied totally in 19 different medical inpatient and elective surgery wards and units at the end of the visits allocating 30 minutes for each ward and visiting together with chief nurse of each ward. Data was
collected performing bedside rounds together with chief nurse of the ward and scrutinizing patient records when it was considered necessary. The condition of the ward at that moment (to gain a snapshot) were tried to be defined. 762 beds were examined, totally. Two academic physician’s consultancy was applied particularly for the waste types in the modules of Diagnosis, Treatment and Patient Care. After defining waste proportions, a costing study was carried out on the basis of the prices indicated in the Notification of Implementation in Healthcare (SUT).

Execution of Patient Module was carried out by two healthcare personnel in 19 different medical inpatient and elective surgery ward and units between June 27th, 2012 and July 7th, 2012. All clinics were paid a visit in working hours. Chief nurses of wards and units were asked about patients who would be discharged and one on one basis interviews were conducted with 61 patients, totally.

Patient Care Module application was carried out by three healthcare personnel in 19 different medical inpatient and elective surgery wards and units between July 23rd, 2012 and December 31st, 2012. All clinics were paid a visit in working hours. 154 patients’ records (all the patients’ records who were being treated in Intensive Care Units (ICU) and random sampling of the records of patients who were being treated in other wards and units were included) were examined together with nurses who were bedside caregiver at that time.

Diagnosis Module application was carried out by a healthcare personnel in 11 different elective surgery wards and an emergency unit between August 3rd, 2012 and August 8th, 2012. Data were collected according to worksheet of five waste types (Table-1).

Treatment Module application was carried out by two healthcare personnel in 19 different medical inpatient and elective surgery wards and units between August 14th, 2012 and August 22nd, 2012. All clinics were paid a visit in working hours. Chief nurses of wards and units were asked primarily whether they have standards involved in anticoagulation, glucose management, postoperative care and pain control which are four waste types in this module. Afterwards, an assessment was carried out on the basis of observations of the whole patients who receive treatment in the wards and units. Patients who undergone elective hip replacement surgery in the context of postoperative care, patients who are post-op in the context of pain control and patients who receive insulin or its derivatives in the context of glucose management were placed under observation. 86 patient records which are suitable to treatment module were examined.

RESULTS

27 waste types were defined, and their proportions were determined after implementing THE modules (Table-1). Overall waste proportions of five modules were like followed: Word Module 11,11%, Patient Module 16,50%, Patient Care Module 2,52%, Diagnosis Module 44,20% and Treatment Module 25,29 %. The cost of determined using ward module only was $1.725.275. The most important waste types in terms of clinical and patient safety were healthcare-associated infections, delayed clinical care and flow delay. We think that The information about waste types that come in to prominence is of vital importance to the Social Security Institution.

General average of 9 waste types was determined as 11,11% in Ward Module (units; inpatient wards). The first three waste types particularly were comprised of wastes involved in business capacity, unutilized capacity and de-facto capacity. As for waste types marked in red are those which presents crucial importance to the Social Security Institution.

These are significant events associated with patient safety concerns which could be constructed according to understanding of “Non-Payment Preventable Event” (27) and are not compensated by the reimbursement system. The proportion of Healthcare-associated Infections was determined as 13,39% and as for cost of them were determined as 1.049.949 $ according to prices indicated in the Notification of Implementation in Healthcare (computation formula was given in footnote, thoroughly). If Non-Payment Preventable Event politics could have been implemented, 1 million dollars roughly would have been saved up. As known, healthcare-associated infections are one of the essential parameters that emerge after hospitalization and are utilized in evaluating the quality of healthcare service. (28)

As for waste types referring to Social Security Institution in Patient Module are incidents that aren’t helpful or that are hindering recovery (43% and 5%). Ward Module moreover was assessed considering waste types in the context of 19 wards or units. Internal and normal Intensive Care Units were ones those in which the most waste encountered.

General waste rate of Patient Care Module is 2,52% and that module is the most incomprehensible to be understood by collocutors. This module should be rearranged regarding Turkey’s conditions. Another module is Diagnosis Module and that is the one which is the most waste was encountered (44,2%). The most waste proportion amongst the whole waste types in the whole modules occurred in Metabolic Panel (83%). One would need expert opinion to asses Diagnosis Module, because HIWIT indicates that an assessment
should be made for the admission in first 12 hours and proportions, which are determined accordingly, should be marked as potential waste. Waste proportion of the Patient Care Module, which is the last one, was determined as 25.29. The most important cause of that is HIWIT inquiry of whether there is any standard protocol or pathway is used in four domain of treat (anticoagulation, glucose management, postoperative care and pain control).

Table 1. Table of Proportions and Costs of Ward, Patient, Patient Care, Diagnosis and Treatment Modules

<table>
<thead>
<tr>
<th>Waste Number</th>
<th>WASTE TYPES</th>
<th>PROPORTIONS (%)</th>
<th>DETERMINED COST (ANNUAL - $)</th>
<th>LOCAL COMPLIANCE</th>
<th>PATIENTS ANALYSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Ward Generally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bed Empty &amp; Staffed</td>
<td>47.32</td>
<td>572400</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>2</td>
<td>Bed Empty &amp; Not Staffed</td>
<td>16.96</td>
<td>205200</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>3</td>
<td>Bed Occupied or Used Inappropriately</td>
<td>2.68</td>
<td>32400</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>4</td>
<td>Healthcare-associated Infection</td>
<td>13.39</td>
<td>1886760</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>5</td>
<td>Adverse Drug Event</td>
<td>0</td>
<td>0</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>6</td>
<td>Procedure Complication</td>
<td>2.68</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>7</td>
<td>Unnecessary Hospitalization</td>
<td>2.68</td>
<td>171000</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>8</td>
<td>Flow Delay</td>
<td>1.04</td>
<td>115200</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>9</td>
<td>Clinical Care Delay</td>
<td>0.54</td>
<td>147360</td>
<td>COMPATIBLE</td>
<td>332</td>
</tr>
<tr>
<td>B) Discharge Generally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Unnecessary Waiting</td>
<td>4.3</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>61</td>
</tr>
<tr>
<td>2</td>
<td>Incidents That Aren’t Helpful or That Are Hindering</td>
<td>5</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>61</td>
</tr>
<tr>
<td>3</td>
<td>Waiting Longer Than Expected</td>
<td>13</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>61</td>
</tr>
<tr>
<td>4</td>
<td>Incidents Causing Harm</td>
<td>5</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>61</td>
</tr>
<tr>
<td>C) Patient Care Module Generally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Monitoring</td>
<td>1.2</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>154</td>
</tr>
<tr>
<td>2</td>
<td>Invasive Tools</td>
<td>3.2</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>154</td>
</tr>
<tr>
<td>3</td>
<td>Medications</td>
<td>6.4</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>154</td>
</tr>
<tr>
<td>4</td>
<td>Tests</td>
<td>0.6</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>154</td>
</tr>
<tr>
<td>5</td>
<td>Therapies</td>
<td>1.2</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>154</td>
</tr>
<tr>
<td>D) Diagnosis Module Generally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Urinalysis</td>
<td>17</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>129</td>
</tr>
<tr>
<td>2</td>
<td>Thyroid Function Studies</td>
<td>22</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>129</td>
</tr>
<tr>
<td>3</td>
<td>Electrocardiogram (ECG)</td>
<td>38</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>129</td>
</tr>
<tr>
<td>4</td>
<td>Chest X-Ray (CXR)</td>
<td>61</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>129</td>
</tr>
<tr>
<td>5</td>
<td>Metabolic Panel</td>
<td>83</td>
<td>NOT COMPUTED</td>
<td>R+E</td>
<td>129</td>
</tr>
<tr>
<td>E) Treatment Module Generally</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anticoagulation</td>
<td>39.53</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>86</td>
</tr>
<tr>
<td>2</td>
<td>Glucose Management</td>
<td>26.74</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>Postoperative Care</td>
<td>3.01</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>86</td>
</tr>
<tr>
<td>4</td>
<td>Pain Control</td>
<td>34.88</td>
<td>NOT COMPUTED</td>
<td>COMPATIBLE</td>
<td>86</td>
</tr>
<tr>
<td>Average of the Whole Modules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.58</td>
<td>PATIENTS ANALYSED</td>
<td>762</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: R: Should be Revised, E: Needs Expertise Opinion

1 USD/TRY exchange rate was 1.797 on Sep 5th, 2012.
2 Waste Cost for ICU’s = Price of Staying in ICU for One Day * 450 (care, treatment, laboratory, screening, consultation, antibiotic included) * Number of Patients * Number of Days Stayed in Hospital
3 Waste Cost for Other Wards = (The Cheapest Antibiotic (1 dose): 3.84, (Generally, when it is used 3 dose daily) 3.84x3 = 11.5) + The Charge of Intravenous Injection: 2.4 (2.4x3 dose = 7.2) + The Charge of Establishing Vascular Access: 4.8 + The Charge of Staying of One Night: 30 + The charge of Hospital Attendant for One Day: 10 + The charge of Consultation: 6 + The charge of the Whole Blood Hemogram Analysis: 3.30x Number of Patients x Number of Days Stayed in Hospital
DISCUSSION
HIWIT is deemed as successful in waste classification and assessment considering 5 modules and 27 waste types. Ward, Patient and Diagnosis Modules are comprehensible to be understood by collocutors, so one had not difficulty in making an assessment about them. Collocutors had difficulty comprehending the Modules of Diagnosis and Patient Care, therefore, implementers needed guidance about what should be understood of waste. These two modules were constructed as a mechanism to determine THE potential waste risks within waste identification tool. In other words, numbers should be deemed positively in the sense of waste.

One should commence a critical action once defining waste. There is a necessity that those modules whose waste has not been calculated to be evaluated by an expert team in order to hospital’s institutional capacity in terms of waste can be improved. The team that will make cost analyses should include someone from senior management and they should lead to such efforts. Waste calculating cannot be utilized unless lacking support from top management is obvious.

The case of some 762 beds were analyzed totally demonstrates that a serious volume attained. Therefore, one can conclude that there is necessity to give priority to Ward and Patients Modules with regards to Social Security Institution. There are also other types of waste which are defined apart from 27 waste types indicated in WIHI:

1. Not being entered of ECGs
2. Promulgated use of prophylactic antibiotics which is used to keep patients out of hospital associated infections until discharging.
3. Not being purchased medicines that are not used for patient in course of time which involved in medicines which should be administered when necessity occurs (This practice is the one which as well as increases workload and makes difficult of the control of medicine entry, rather comprises potential waste).

For example, we determined that 80-85 of every 100 patients who were admitted to emergency service had ECG test in our hospital practice. One can see that 30 percent of all ECG’s were made entry as for in retrospective study made through patients’ records. There was a loss around an average of 50. If we assume the number of people as 50 daily, the annual cost (50x30x12 = 18000 ECG test) can be calculated as 54.000 (18.000 x 3 TL each test). As is known, every operation made in emergency service can be compensated from reimbursement systems. Such as, it should be considered that there can be certain proceedings which are not entered.

The priority should be afterwards establishing an expert team for Diagnosis and Treatment Modules, picking, classifying waste points which are specified as potentially. As for after this mechanism of waste determination, a financial evaluation should be made for the picked and classified waste profiles.

Annual cost of the waste which is rife in all the ground of healthcare reaches to some 1 trillion dollars according to a study conducted by Berwick and Hackbarth in 2012. And this also constitutes of about 40% of US healthcare expenditures of 2.6 trillion dollars (26). This quantity is crucial regarding the blockage potential to reimbursement systems of waste points throughout the whole healthcare system. The cost of waste in a 332 beds hospital for just Ward Module was determined as 1.725.275 $. As a matter of fact, a 300 beds hospital could by the means of the tool determine a waste of some 6 million dollars annually (5), thus improvement activities can be scheduled for the factors that leads to waste, according to HIWIT.

Four components were intended to acquire through waste study: improving performance, diminishing operational costs, shortening operational cycles and improving patient safety. After identifying the main priority areas of waste types, a financial expert or team should be utilized in understanding the financial implications of them. Diagnosis, treatment and patient care modules particularly are expected to contribute more to patient safety which is one of the four intended output components.

CONCLUSION
HIWIT is considered as an optimal tool to determine of components which will be useful in defining of waste and in revealing of related costs for the use of Social Security Institution which is the main reimbursement institution of the Turkey.

We declare that they have no conflict of interest.

REFERENCES
Sözel Bildiriler, 2013


