



Original article

The challenge of sustainability in healthcare systems: Frequency and cost of inappropriate patterns of breast cancer care (the E.Pic.A study)



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ABSTRACT

Objectives: In a context of decreasing economic health resources and a rise in health needs, it is urgent to face this sustainability crisis through the analysis of healthcare expenditures. Wastages, deriving from inappropriate interventions, erode resources which could be reallocated to high-value activities. To identify these areas of wastages, we developed a method for combining and analyzing data from multiple sources. Here we report the preliminary results of a retrospective cohort study evaluating the performance of breast cancer (BC) care at IRST, an Italian cancer institute.

Materials and methods: Four data sources gathered in a real-world setting (a clinical database, two administrative databases and a cancer registry) were linked. Essential Key Performance Indexes (KPIs) in the pattern of BC diagnosis (KPI 1 and 2) and treatment (KPI 3 and 4) based on current guidelines were developed by a board of professionals. The costs of inappropriate examinations were associated with the diagnostic KPIs.

Results: We found that 2798 patients treated at IRST from January 2010 to June 2016 received a total of 2516 inappropriate examinations accounting for € 573,510.80. Linkage from multiple routine healthcare data sources is feasible: it allows the measurement of important KPIs specifically designed for BC care, and the identification of areas of low-value use of the resources.

Conclusion: If systematically applied, this method could help provide a complete picture of inappropriateness and waste, redirect these resources to higher-value interventions for patients, and fill the gap between proper use of the resources and the best clinical results.

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1. Introduction

In developed countries, oncology represents an increasing burden on the healthcare budget. Major determinants of healthcare expenditures include the increase in cancer incidence, closely linked to population aging, and the use of new high-cost drugs and technologies, especially in patients with advanced disease. These innovations have led to an improvement in survival rate, but challenge the sustainability of health systems. It is estimated, for

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Abbreviations

BC	Breast Cancer
CH	Chemotherapy
EHR	Electronic Health Record
E.Pic.A.	Economic Appropriateness of an Integrated Care Pathway (Appropriatezza Economica del Percorso Integrato di Cura)
HDC	Hospital Discharge Card
IRST	Istituto Scientifico Romagnolo per lo studio e la cura dei Tumori
KPI	Key Performance Index
RTRo	Registro Tumori della Romagna
SA	Specialist Assistant

example, that in the USA the costs of cancer care will increase by an average of 20% per year in the period 1990–2020 [1,2].

Breast cancer (BC) is the most common cancer among women in western countries [3], and the second leading cause of cancer-related death [4]. It is a clinically complex condition, which requires a coordinated multidisciplinary approach and is susceptible to different treatment solutions due to its heterogeneity [5]. The increasing trend towards the centralization of BC care in multidisciplinary breast units has probably promoted a greater adherence to practice guidelines, but the patterns of care actually provided and the associated costs have seldom been evaluated [6].

The funding of the Italian health system will not increase significantly in coming years [7]. By implication, it is plausible to assume that no new resources will be allocated to oncology, even if the needs will increase. In Italy, where budget constraints are threatening the sustainability of the healthcare system, a thorough analysis of healthcare expenditures has shown that waste accounts for about 20–30% of global health costs [8]. Wastages derive from inappropriate interventions, i.e. actions that are not recommended by national and international guidelines and do not add significant therapeutic advantages. Avoiding this loss of resources is imperative. In addition, wastages can ultimately damage patients and affect the quality of care. In such a challenging context, policy makers and healthcare providers are striving to create performance measurement systems.

Measuring performance in healthcare is a challenging and debated issue, centered on the value of healthcare, defined as the health outcome achieved at the population level per amount of expenditure [9]. This entails accessing, processing, combining, and analyzing a variety of data from multiple and heterogeneous sources.

In the current paper, we report the preliminary results of a retrospective cohort study in which we evaluated the performance of BC care by connecting information gathered from four data sources in a real-world setting. Our rationale was two-fold: first, to develop a method for identifying areas of wastages with the aim to reallocate these resources into high-value activities; second, to fulfill the gap between health management and clinical practice, i.e. between proper use of the resources and the best clinical results. In detail, our objectives were: *i*) to verify the possibility of data linkage between different sources, each with a different level of validation, completion and timeliness; *ii*) to measure Key Performance Indexes (KPIs), based on international guidelines on BC care and identified in the Economic Appropriateness of an Integrated Care Pathway (Appropriatezza Economica del Percorso Integrato di Cura, E.Pic.A.) study and *iii*) to determine their associated costs in order to identify

areas of low-value use of the resources.

2. Methods

2.1. Setting

The study was conducted at the Istituto Scientifico Romagnolo per lo Studio e la Cura dei Tumori IRST of Meldola, Forlì, Italy.

2.2. KPIs

Using a new approach for performance evaluation, as proposed in the E.Pic.A. study, a board of professionals identified 7 KPIs in the pattern of BC diagnosis and treatment (local and systemic), on the basis of the current guidelines from the Italian Association of Medical Oncology (Associazione Italiana di Oncologia Medica, AIOM) [10] and the National Comprehensive Cancer Network (NCCN) [11]. These KPIs were defined in consideration of what could be retrieved from administrative databases. In the current paper we show the preliminary results of 4 of the KPIs comprised in the E.Pic.A. study.

KPI 1, pre-surgery, was defined as the proportion of patients with stage I or II disease (defined through the tumor, node, metastasis [TNM] staging of the pathology report obtained at surgery) who underwent one of the following examinations: hepatic ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI) (except for the thorax), positron emission tomography (PET), bone scan, within two distinct timeframes. Since the reasons for performing examinations are generally not indicated in clinical databases, we hypothesized two scenarios: the first was based on the assumption that each test was related to BC, and the second scenario was based on the assumption that patients could have undergone a specific examination for reasons unrelated to cancer, such as the presence of comorbidities and/or the patients' attitude and socio-economic context. In the first scenario, in rigorous adherence to current guidelines, each of the above-mentioned exams was considered as inappropriate if performed within 2 months before breast surgery. In the second scenario, one of the above-mentioned examinations was considered as inappropriate only if it had been performed more than once within 6 months before breast surgery, except for bone scan which was considered as inappropriate in any case. In both scenarios, the number of PET-scans was also measured for stage III patients: these exams were considered as inappropriate in any case. The time windows chosen referred to the date of surgery, because the date of diagnosis is not retrievable from the administrative databases.

KPI 2, post-surgery, was defined as the proportion of patients with stage I or II disease (defined through TNM of the pathology report obtained at surgery) who performed one of the following exams: hepatic US, CT, MRI, bone scan, PET scans (including stage III patients) within 2 months after breast surgery. Each of the above-mentioned exams was considered as inappropriate.

KPI 3, subsequent intervention after mastectomy, was defined as the proportion of patients who received axillary dissection and/or breast reconstruction within 3 months after mastectomy.

KPI 4, chemotherapy (CH) timing, was defined as the proportion of patients who received adjuvant CH within 60 days after surgery.

2.3. Data sources

To measure the KPIs, the following information was collected: date of first diagnosis, stage at diagnosis, date and type of surgery, performed examinations and date of first CH. Information retrieval was gained through the use of four data sources: (1) the IRST clinical database Log80; (2) the administrative database Hospital

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