The challenging mission of university hospitals in the changing healthcare scenario: the role of performance evaluation
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Autore
Tommaso Grillo Ruggieri

Tutor
Professoressa Sabina Nuti
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Tutor and Supervisor: Professoressa Sabina Nuti
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Table of contents

EXECUTIVE SUMMARY ................................................................. 1
§ CHAPTER 1 - Introduction ............................................................ 4
  § 1.1. Background .......................................................................... 4
    § 1.1.1. The hospital role in a changing health scenario .................... 4
    § 1.1.2. A focus on university hospitals ........................................... 10
    § 1.1.3. Hospital performance evaluation: towards a broader perspective . 13
  § 1.2. The design and outputs of the Ph.D. research .......................... 15
    § 1.2.1. The research design ......................................................... 15
    § 1.2.2. Snapshot of the Ph.D. papers ............................................ 18
  § 1.3. References ........................................................................ 21
§ CHAPTER 2 - Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions ......................................................... 27
  § 2.1. Introduction ......................................................................... 28
  § 2.2. Background ........................................................................ 28
  § 2.3. Methods ............................................................................. 32
  § 2.4. Results .............................................................................. 35
  § 2.5. Discussion ........................................................................ 41
  § 2.6. Conclusions ..................................................................... 44
  § 2.7. References ........................................................................ 45
§ CHAPTER 3 - Patient satisfaction and outcomes in Italian university hospitals: a cross-sectional analysis ............................................................. 50
  § 3.1. Background ........................................................................ 51
  § 3.2. Methods ............................................................................ 55
  § 3.3. Results .............................................................................. 58
  § 3.4. Discussion ........................................................................ 62
  § 3.5. Conclusions ..................................................................... 64
  § 3.6. References ........................................................................ 65
§ CHAPTER 4 - Bridging the Gap between Theory and Practice in Integrated Care: The Case of the Diabetic Foot Pathway in Tuscany ................................. 70
  § 4.1. Introduction ....................................................................... 71
  § 4.2. Background ....................................................................... 71
  § 4.3. Methods ............................................................................ 75
  § 4.4. Results .............................................................................. 78
EXECUTIVE SUMMARY

This Doctoral Thesis aims at investigating the evolving role of performance evaluation in supporting university hospitals in pursuing their complex mission, coping with the changing healthcare scenario.

These institutions are in charge, as other hospitals, to contribute to the main objectives of the healthcare systems: quality of care, financial sustainability and equity (i.e. universal coverage in Beveridge and Bismarck models). In addition, they are complex organizations entrusted with the crucial mission of training future clinicians, which represents a core task to address the current challenges and to succeed in achieving the mentioned objectives.

Healthcare policy-makers and managers are testing and seeking for governance and organizational strategies in order to cope with the demand-side evolution sharply affected by the growing burden of chronic diseases. Indeed, the evolving health scenario imposes a redesign of the healthcare service delivery focused on patient-centred and integrated care between providers, disciplines and professionals, towards a less fragmented and hospital-centred system.

University hospitals should therefore pursue their specific mission and the objectives of the healthcare systems in this challenging redesigning process. They are required to train future clinicians considering a system perspective, overcoming the traditional organizational boundaries, and to lead the patient-centred focus.

Performance evaluation can provide an essential support for policy-makers, managers and clinicians in this challenging scenario.

This Thesis combines three papers that provide insights on how performance evaluation can evolve in order to guide the necessary strategies and foster a system perspective, with a particular focus on the role of university hospitals.

Chapter One introduces the background of the Thesis considering the challenges posed by the health scenario, the evolving role of hospitals and performance evaluation, and the complex mission of university hospitals. This chapter outlines also the research design and outputs.

Chapter Two presents the first paper, which aims at investigating different performance between university and general hospitals in the Italian context, emphasizing the need for linking the teaching status to performance results.
Chapter Three investigates the relationship between patient satisfaction and outcomes in the university hospital context and provides insights on how hospital performance should be analysed with a pathway perspective.

Chapter Four presents the third paper, which describes how performance evaluation can enable a community of professionals to discuss the determinants of geographic variation of performance in a multi-providers, multi-professional and multi-disciplinary care pathway and to identify integrated care solutions to be spread. The paper provides a focus on the barriers to integrated care faced by university hospitals.

Chapter Five outlines some final remarks.
§ CHAPTER 1- Introduction

This chapter outlines the background of the Thesis considering the evolving role of hospitals, with a particular focus on university centres, and performance evaluation, considering the challenges posed by the health scenario. Hence, the research design and outputs are presented.

§ 1.1. Background

§ 1.1.1. The hospital role in a changing health scenario

In 2001, the Institute of Medicine (USA) in its report “Crossing the quality chasm: a new health system for the 21st century” described the healthcare delivery system by stating: <<Care delivery processes are often overly complex, requiring steps and handoffs that slow down the care process and decrease rather than improve safety. These processes waste resources; leave unaccountable gaps in coverage; result in the loss of information; and fail to build on the strengths of all health professionals involved to ensure that care is timely, safe, and appropriate>> [IOM 2001, p. 28].

In 2002, the European Observatory of Health Systems in its report “Hospitals in a changing Europe” described the extensive hospital capacity reduction occurred throughout Europe and the evolving role of hospitals in the healthcare service delivery in response to the aging population and the growing financial constraints [McKee and Haley 2002]. In 2009, the European Observatory in its report “Investing in hospital of the future” observed that hospitals were still under the expected epidemiological, financial and technological pressures:

<<Today’s hospitals in Europe face particular challenges. They have to adapt to many shifting but coalescing factors, including ageing populations, changing patterns of disease, a mobile health care workforce, the introduction of new medical technologies and pharmaceuticals, increasing public and political expectations, and new financing mechanisms.>>

[Rechel et al. 2009, p. 5]
During the last fifteen years, in European countries hospital capacity has been gradually and further reduced [Rechel et al. 2009], as confirmed by the most updated data of the OECD indicator “Total hospital beds per 1.000 population”\(^1\).

As in previous years, this process was linked to shorter hospital lengths of stays and higher share of patients treated in ambulatory, day-case care, or alternative care settings. Hospital capacity reduction was driven by the financial constraints and the need for shifting resources outside hospital walls towards other care settings, in order to cope with the increasing demand of services linked to chronic diseases.

Chronic diseases are today’s main cause of death in European countries [Mackenbach and McKee 2013] and their impact on social and healthcare sectors is expected to furtherly increase. In the EU countries, the share of population aged more than 65, which was 17% circa in 2007, is expected to raise to 28% circa by the 2040 [Fernandez et al. 2009]. Concurrently, the share of population aged over 80 years old will double within the year 2050, growing from 4.7% to 11.3% [OECD 2013]. This will certainly yield to higher share of population with multiple chronic conditions and complex needs, whose care require comprehensive health and social services connecting several professionals, disciplines and providers [Nolte and McKee 2008; JC 2008\(^2\); Coyte et al. 2008; Goodwin et al. 2013; Rechel et al. 2009b]. Moreover, the progressive reduction of informal care delivered at patient home due to the societal evolution (higher share of elderly people living alone\(^3\), weaker traditional family support, people mobility) is expected to produce an additional increase in the demand of institutional social and healthcare services [Coyte et al. 2008; Fernandez et al. 2009].

The demand-side is therefore shifting from acute to chronic needs and it requires a progressive redesign of the healthcare service delivery, whose fragmentation still represents a major challenge for policy-makers and managers. In addition, these issues is linked and are addressed with tighter financial constraints.

The healthcare delivery system is often described as a set of silos-structures skewed towards hospital-centred episodic and acute models of care, which hinders

\(^1\) According to the OECD data, between 2000 and 2013, in European Countries such as Italy, Sweden, Spain, UK, France, and Finland there has been a 20-35% reduction in the number of beds per 1.000 population. Complete data are available on OECD website: [http://www.oecd.org/els/health-systems/oecd-health-statistics-2014-frequently-requested-data.htm](http://www.oecd.org/els/health-systems/oecd-health-statistics-2014-frequently-requested-data.htm).

\(^2\) In 2008, in USA 20% Medicare patients were affected by five or more chronic conditions [JC 2008].

\(^3\) In Italy, for example, the percentage of woman living alone aged over 65 years old doubled from 1970 and 2000 [Fernandez et al. 2009].
the necessary coordination and integration across professionals, disciplines, care settings and providers.

Therefore, during the last decade, there has been a widespread and increasing demand for greater patient-centred care and linkage between care settings and professionals in order to make healthcare more accessible, easy to navigate, safe, effective, and affordable. [Nolte et al. 2008; Nolte and McKee 2008; JC 2008; Coyte et al. 2008; Rechel et al. 2009b; Porter and Lee 2013; Goodwin et al. 2013; Naylor et al. 2015]. This process is still ongoing, deals with different aspects of the healthcare governance (organization, reimbursement system, etc) and involves all the different care settings (primary, community, hospital, long-term, and home care, etc) in tax-funded Beveridge healthcare systems, as well as in countries adopting Bismarck and private insurance-based models.

In this sense, diverse strategies were implemented in order to enlarge prevention, primary and long-term care, promoting service delivery in both institutional (e.g. nursing home) and non-institutional (e.g. home) settings alternative to hospitals [among others: Hensher and Edwards 2002; Coyte et al. 2008; Rechel et al. 2009b; Naylor et al. 2015].

In addition, great emphasis has been placed on the need for improving continuity of care between settings, with particular regards to the interface between hospitals and community and primary care. In this sense, several authors and organizations (e.g. the World Health Organization), focused on the need for enhancing integrated care, a complex concept linked to a wide range of theoretical definitions and related to other common concepts such as “continuity of care”, “coordination”, and “integration”. [see among others: Leutz 1999, Kodner and Spreeuwenberg 2002; Reed et al. 2005; WHO 2008; Valentijn et al. 2013; Nolte and Pitchforth 2014].

As observed by Hensher and Edwards, the interface between hospitals and other care settings represents both: i) an opportunity to filter the access to these facilities and to accelerate discharge by improving primary and community care and post-discharges services; ii) the place where invest in integration among settings [Hensher and Edwards 2002].

In 2002, Kodner and Spreeuwenberg defined integration and its aims as "a coherent set of methods and models on the funding, administrative, organizational, service delivery and clinical levels designed to create connectivity, alignment and collaboration within and between the care and cure sectors. The goal of these methods and models is to enhance quality of care and quality of life, consumer satisfaction and system efficiency for patients with complex, long-term problems cutting across multiple services, providers and settings. The result of such multipronged efforts to promote integration for the benefit of these special patient groups is called "integrated care"" [Kodner and Spreeuwenberg 2002, p.4]. In 2008, the WHO proposed a comprehensive definition of integrated service delivery: "the organization and management of health services so that people get the care
In this scenario, the evolving hospital role within the healthcare network represents a crucial challenge for ensuring quality of care and financial sustainability in future and, therefore, it is a core issue in the agenda of healthcare policy-makers and managers. In this sense, the King’s Fund (UK), in its report “Acute hospitals and integrated care. From hospitals to health systems” identified four required changes in the hospital role: <<moving from an organisational focus to a system-wide perspective; working more closely with local partners, including primary care, social care and community services; developing integrated service models that span organizational boundaries; providing services through horizontal networks with the acute hospitals>> [Naylor et al. 2015, p. 4].

At present, two major strategies for the redesign of the hospital role can be identified: the horizontal networking and the vertical integration.

The first tension aims at reshaping the hierarchical network among hospitals and redesigning the mission of the individual facilities with a focus on acute care delivery. This process aims at reallocating acute and complex care delivery in order to contain costs, achieve economies of scale and improving performance, with particular regard to concentrating in tertiary hospitals the delivery of treatments whose outcomes proved to be associated with volumes delivered [see for example, Birkmeyer et al. 2012].

At the same time, as previously discussed, the second pressure aims at facing the barriers at the interface between hospitals and the other providers, by reallocating care phases outside hospital walls (both prior to the inpatient admission and at the discharge point) and enhancing integration among different care settings beyond the traditional organizational boundaries.

Most applied or expected strategies aimed at redesigning the hospital role can be related to these two major trends.

Focusing on the Italian context and considering the horizontal networking, a regulation of the Health Minister (D.M. 70/2015) has recently specified precise volume-thresholds for several surgical treatments. In addition, the regulation detailed population catchment areas for each clinical disciplines and asked Regional Administrations to redesign the hospital network according to this rule.

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they need, when they need it, in ways that are user-friendly, achieve the desired results and provide value for money>> [WHO 2008, p. 5].
Considering the pressure for integration, there are several examples of strategies applied at the interface between hospitals and the other providers, both in different contexts and at different levels. These strategies include: the reconfiguration of rural and district hospital wards in nurse-led departments with direct collaboration of GPs; the implementation of the Chronic Care Model and disease management programs; the identification of care-coordinators and multidisciplinary/multi-professional teams to follow and guide patients across the multi-provider paths after the hospital discharge (also in order to reduce avoidable hospital admissions and re-admissions); the implementation of integrated ICT among providers and professionals; the transfer of patients from hospitals to not-institutional settings (i.e. home-based) or institutional setting (e.g. nursing-led clinics); the creation of hospices for end-of-life care. [see among others: Hensher and Edwards 2002; McKee and Nolte 2004; Goodwin et al. 2013; Busse et al. 2010; Curry and Ham 2010; Naylor et al. 2015].

The strategies implemented to redesign the hospital role in the healthcare delivery are deeply related to the context where they are applied, with particular regard to the institutional model adopted (Beveridge, Bismarck, private insurance-based).

Moreover, governance models can affect providers’ behaviour and the healthcare delivery redesign. In particular, policy-makers may drive the healthcare system through five main identified governance models [Bevan and Fasolo 2013; Bevan and Wilson, 2013; Nuti et al. 2015]:

i) “Trust and altruism”: this model assumes that individuals are motivated to perform well. Therefore, tools and mechanisms to incentivize behaviour are not required;

ii) “Hierarchy and targets”: this model rewards the required behaviour and sanctions failure to improve performance and achieve the expected results;

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6 Valentijn and colleagues described three different levels of integration. The macro-level integration operates across sectors. The meso-level integration operates within and between organizations in order to diffuse actions across the entire care continuum overcoming cultural, professional and bureaucratic boundaries. The micro-level integration operates between clinicians and the patient in order to enforce the continuity of care and meet patient needs, regardless of specific organizational functions or structures [Valentijn et al. 2013].
iii) “Reputation” or “Transparent public ranking”: in this model, performance evaluation drives a reputational competition among clinicians and providers through public disclosure and an easy-to-navigate reporting system for public.

iv) “Choice and competition”: this model assumes that individuals choose the high-performing providers, which compete for market shares.

v) “Pay for performance”: this model relies on financial incentives to motivate and reward successful results.

In particular, in the healthcare systems mainly adopting a “choice and competition” model and a prevalent hospital reimbursement system based on fee-for-service, “money follows the patients” [Bevan and Fasolo 2013]. Therefore, hospitals have a “natural” incentive to have a mono-provider perspective and to increase the volumes delivered [Busse and Mays 2008]. Hence, in these contexts, there may be barriers and disincentives towards integrated care and there may be also issues linked to appropriateness and financial sustainability [Seghieri et al. 2016].

In most healthcare systems adopting the Beveridge model, as Italy, the service delivery is mainly financed by a single-payer institution through a capitation-based planned resource allocation. Governance models varies between Regions [Nuti et al. 2015]. The prevalent governance model is “trust and altruism”, and, to a minor extent, “public transparent ranking” and “hierarchy and targets” [Nuti et al. 2015].

In these contexts, performance evaluation has proved to be an effective tool for activating and fostering improvement strategies, in particular when different governance models are combined and public disclosure of performance is ensured [Pinnarelli et al. 2012; Nuti et al. 2013; Nuti et al. 2015].

Besides the public reporting of performance, two other elements can be relevant: a public commitment consistent with clear vision, goal, related strategies and accountability for their execution; the engagement of clinicians in sharing goals and in the consistent strategies [Brown et al. 2012].

In these healthcare systems, considering the challenges posed by the changing health scenario and the healthcare delivery redesign, how performance evaluation should evolve besides the hospital role in order to provide an effective support?

As hospital care is increasingly dedicated to a specific acute phase in multi-provider care pathways, which begins and continues outside hospital walls, hospital
performance should not be analysed and interpreted without considering the care pathway before and after the inpatient admission and discharge.

Performance evaluation should indeed shift from the “traditional vertical” evaluation based on the care setting level to a “horizontal” evaluation based on a system and pathway perspective.

§ 1.1.2. A focus on university hospitals

In Italy, as in other countries, complex/tertiary care (e.g. neurosurgery, cardiac surgery, etc) is provided by hospitals often identified as teaching institutions. These hospitals are also referral centres for the provision of treatments whose effectiveness has proved to be associated with high delivered volumes.

In Italy, teaching hospitals can be classified considering the ownership and the different institutional and organisational relationship between the hospital administration, the other Health Authorities and the University Medical Schools. Indeed, there is a complex institutional and regulatory framework with different categories and degrees of organizational integration or collaboration between teaching hospitals and the University Medical Schools [Carbone et al. 2010]. Irrespectively from these different categories, in this Thesis the university hospitals (UHs) are identified as those institutions that are owned or are integrated with a private or public university Medical School.

These institutions are in charge of comprehensively pursuing and balancing three different objectives: care, education and research. Besides providing high quality patient care, these institutions are therefore committed to improve patient care through research and are in charge of the crucial role of training next generations of clinicians.

In these hospitals, the three-fold mission may be considered both interdependent and conflicting as its components are naturally connected but managed with different priorities by academic physicians and the other clinicians [Smith and Whitchurch 2002]. This occurs also because physicians usually follow different career paths and are employed by two different entities (the hospital administration and the University). Hence, complexity sharply increases as UHs combine and double the features of Mintzberg’s professional bureaucracy [Mintzberg 1983] embedded within both the healthcare organizations and the university context.
In this sense, these institutions embodies the increasing complexity described by Smith and Whitchurch. In this context the <<roles and relationships at the interface of health and education might be described as “extra supercomplex”, in that they have to continually evaluate organizational arrangements to deliver teaching, research and service activity because of discrete strategies in components of the mission>> [Smith and Whitchurch 2002, p. 41]. As highlighted by the authors, the mission of UHs faces pressures for cost reductions, a growing focus on value-for-money and quality assessment, and the increasing emphasis on multi-professional and less hospital-centred education.

Complexity increases as university hospitals are huge organizations with several disciplines and many departments. In addition, UHs are independent organizations with respect to the Local Health Authorities that are responsible to organize the healthcare delivery system in a specific geographic area. These internal and external boundaries increase the chance for uncoordinated and fragmented care, which is identified as one of the major concern related to the current healthcare delivery organization.

In Italy, as in other countries [see for example, Bevan 1999], university hospitals receive also an amount of additional resources with respect to other hospitals (e.g. a percentage increase of DRG reimbursements, specific funds for research and high-complex care, etc.) [Carbone et al. 2010; Ferré et al. 2014].

The financial constraints, the evolving health scenario and the connected need for redesigning the delivery system put significant pressures for change on these institutions, with particular regard to their performance and governance.

Moreover, growing emphasis is put on the lack of integration and coordination with other healthcare providers, the need for reshaping the role of acute care and hospital-centred training towards a stronger focus on a multi-provider perspective and on primary/community care and public health [see among others: WHO 2002; Smith and Whitchurch 2002; Greiner and Knebel 2003; Tugwell 2004; Clark and Tugwell 2006; Dubois et al. 2008]. In particular, Smith and Whitchurch raised

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7 Also In this sense, in 2003, the BMJ, the Lancet and other 40 partners promoted the International Campaign to Revitalise Academic Medicine (ICRAM). The main objective of ICRAM was to launch a call for debate, research and proposals in order to revitalize academic medicine by tackling the identified challenges (see the specific BMJ page at http://www.bmj.com/about-bmj/resources-readers/publications/academic-medicine).

8 As stated by the authors: <<Educational programmes may, therefore, need to extend beyond the walls of teaching hospitals in order to give medical trainees educational experience that provides..."
awareness on the increasingly difficult task of pursuing research, education and care within the growing articulate relationships between university and hospitals, focused on diverse priorities and income streams. They also highlighted the pressures posed by the redesign of medical education towards "increased patient contact in the early years of the course, simultaneous multi-professional instruction, and a move of teaching into primary and community care" [Smith and Whitchurch 2002, p. 42] and the need to achieve "Effective ways to manage partnership across institutional boundaries and to explore ways of working in partnership across the whole system, with primary and secondary care" [Smith and Whitchurch 2002, p. 52].

Therefore, considering these insights, university hospitals deserve a particular focus because of their complex organizational and governance framework and their strategic and increasingly challenging role in pursuing the objectives the entire healthcare systems: quality of care, sustainability and equity (in particular in Beveridge and Bismarck models). Indeed, these hospitals:

- are required to provide outstanding performance in patient care. In particular, they are referral centres for complex care and are asked to deliver high volumes and high quality care for treatments with a proved association between volumes and outcomes;

- are increasingly required to be accountable for results in terms of performance and research outputs considering the additional financial resources they receive and the growing financial constraints;

- are complex organizations, independent from the other Health Authorities and providers, facing both internal and external barriers with the other care settings and, as other hospitals, they are required to improve integrated care practice among providers;

- are in charge of the strategic and complex mission of training future clinicians that will work in a changing healthcare delivery system with a focus shifted from the traditional acute and hospital-centred model of care. Considering the necessary redesign of the healthcare system delivery, these hospitals are therefore required to improve the linkage with primary and community care in order to enable the next

them with a broader understanding of healthcare issues, familiarizing them with community-based care and preparing them to work in a variety of settings" [Dubois et al. 2008, p. 161]
generation of clinicians to work with a multi-provider and system perspective, overcoming the traditional organizational boundaries between care settings.

As these tasks are crucial for the future effectiveness and sustainability of the entire healthcare systems, there is therefore scope for a focus on how performance evaluation should evolve along with the changing hospital role in order to support policy-makers and managers in redesigning the healthcare delivery and the medical education systems, with an emphasis on the university hospitals.

§ 1.1.3. Hospital performance evaluation: towards a broader perspective

Performance evaluation is an essential tool to support decision-making processes and performance improvement and to inform patient choice [WHO 2000; Murray and Evan 2003; Arah et al. 2006; Brown et al. 2012; Papanicolas and Smith 2013; Nuti et al. 2013].

The systematic and multi-dimensional assessment of performance has been structured in many countries in performance evaluation systems (PESs) that routinely collect data and publicly report indicators in order to compare healthcare systems and providers at the international, national and regional levels. In western countries, there are several organizations providing a systematic multi-dimensional performance evaluation collecting and publishing measures for quality, efficiency, patient safety, outcomes, appropriateness, avoidable geographic variation, timeliness of care, financial sustainability, patient experience and satisfaction: the Centers for Medicare and Medicaid, the UK Care Quality Commission, the OECD, the King’s Fund, the Dartmouth Institute for Health Policy and Clinical Practice⁹, the Canadian Institute for Health Information, etc.

In Italy, systematic performance evaluation are in particular carried out by: the Ministry of Health, which monitors the respect of certain requirements of the Regional Healthcare Services; the National Agency for Healthcare Services, which monitors and publishes hospital outcomes through the National Outcome Evaluation Program¹⁰; the Laboratorio Management e Sanità (MeS-Lab) of the Scuola Superiore

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¹⁰ Developed by the National Agency for Healthcare Services on behalf of the Ministry of Health, the Italian National Outcome Evaluation Programme (NOEP) is a performance evaluation system which measures outcomes nation-wide. (Institutional website: http://95.110.213.190/PNEed15/index.php).
Sant’Anna, which provides a transparent multidimensional PES for 13 Italian Regions\textsuperscript{11}.

Following the need for patient-centred care, there are several initiatives of systematic patient experience and satisfaction assessment and comparison, considering patient perspective an essential source of information to improve healthcare delivery [Coulter 2011; Coulter \textit{et al.} 2014]. In the USA, the Hospital Consumer Assessment of Healthcare Providers (HCAHPS) survey assesses Medicare hospital quality through patient perspective and is linked to the pay-for-performance scheme “Hospital Value-Based Purchasing”. In UK, several surveys are regularly conducted as relevant source of information for patient decision-making and research [Coulter \textit{et al.} 2014]. In addition, among other international experiences, the UK NHS assesses hospital outcomes through the patient-related outcomes measures (PROMs). In Italy, MeS-Lab administers for some Regions (in particular, for Tuscany Region) systematic surveys assessing patient experience in hospital, emergency department, primary care practice, and maternity care services.

With particular regard to hospital performance, in the last years, its measurement and evaluation has particularly flourished, shifting from a focus on measuring delivered volumes (related to fee-for-services reimbursement scheme) to increasing attention for hospital quality and outcomes [Maarse and Normand 2009].

In most PESs, hospital performance is indeed comprehensively monitored through several measures and hospital data are also often used to indirectly assess performance of the other care settings\textsuperscript{12} (e.g. evaluating community-based services through the rate of avoidable hospitalizations or the readmission rate) [Papanicolas and Smith 2013].

However, following the demand for more integrated, less fragmented and patient-centred care, performance evaluation should evolve towards a system and

\textsuperscript{11} The Inter-Regional Performance Evaluation System (IRPES), developed by the Management and Health Laboratory of the Scuola Superiore Sant’Anna of Pisa (MeS-Lab), provides a multi-dimensional evaluation of performance including measures for efficiency, appropriateness, quality of care, patient and staff satisfaction. This system was first implemented in Tuscany Region [Nuti \textit{et al.} 2013] and was then adopted on a voluntary basis by the majority of other Italian regions. In 2016 the IRPES included Basilicata, Calabria, Emilia-Romagna, Friuli Venezia Giulia, Liguria, Lombardia, Marche, Puglia, Autonomous Province of Bolzano, Autonomous Province of Trento, Toscana, Umbria, Veneto [Nuti \textit{et al.} 2015; Nuti \textit{et al.} 2016].

\textsuperscript{12} A comprehensive assessment and comparison of performance of the other care settings is still in need for further development. Indeed, many countries still need to standardize information flows in primary and community care and to ensure data linkage between hospital data and the other databases (primary care, etc.) through a unique patient ID [Papanicolas and Smith 2013].
pathway perspective. Indeed, several care paths currently and increasingly involve different professionals, disciplines and providers. Hence, also performance evaluation processes should provide a comprehensive evaluation of the different phases delivered along the entire care paths and foster a comprehensive interpretation of results beyond the performance of each individual providers. As the redesign of healthcare delivery, also performance evaluation and result interpretation should therefore shift from the focus on a single, vertical, and mono-provider phase to a broader care pathway perspective.

In this sense, healthcare professionals, managers and policy-makers would benefit from performance evaluation processes that:

- Take into account patient perspective as a relevant sources of information to redesign care pathways more centred on the patient needs, easy to navigate and accessible;
- Emphasize the entire patient care pathway by linking performance measures for all the phases delivered by the different providers and care settings involved (e.g. home, hospitals, community, etc) and for the different services provided (surgical interventions, drug prescriptions, home rehabilitation, etc).
- Consequently allow to analyse and interpret hospital performance with a care pathway perspective. Indeed, hospital performance can be monitored through relevant indicators related to the specific hospital phases such as hospital-acquired infections or specific outcomes of a surgical intervention. However, hospital performance is increasingly related to the performance of other care settings and to the effectiveness of the continuity of care ensured by several providers [Papanicolas and Smith 2013]. Hence, hospital performance should be analysed and interpreted with a broader perspective.

§ 1.2. The design and outputs of the Ph.D. research

§ 1.2.1. The research design

Given these premises, this work and the three papers presented in the following chapters aim at providing insights on how performance evaluation processes may evolve besides the changing healthcare scenario in order to support the healthcare delivery redesigning process, with a focus on university hospitals.
As previously pointed out, university hospitals deserve particular attention as they play the essential role of training the clinicians who will work within a healthcare system delivery progressively moving towards “vertical networking” and “horizontal” integrated care and sharply affected by the chronic disease burden. In this challenging scenario, they will play a central role in the pursuing the main healthcare system objectives: quality of care, sustainability and equity.

In this sense, research, managerial practice and policy-making would benefit from performance evaluation processes focused on:

a) the improvement of the medical education by providing policy-makers with insights on how to link teaching status attribution to performance results;
b) the patient perspective as a source of relevant information to improve and interpret hospital performance and to foster patient-centred care;
c) fostering a broader interpretation of hospital performance through a system and pathway perspective that overcomes traditional organizational boundaries and encourages integrated care practice.

The three articles presented contributes to these issues by:

i) Comparing performance of university and general hospitals in order to understand whether the network of teaching institutions can be improved based on performance results;

ii) Investigating whether and in which care paths patient satisfaction is associated with outcomes in order to provide useful information for managers of university institutions for interpreting and improving hospital performance;

iii) Describing how performance in chronic disease care paths can be analysed as the result of a multi-provider care continuum and affected by silo-working and barriers to integrated care. Performance evaluation combined with other described strategies can activate integrated care practices and encourage hospitals, in particular university centres, to endorse a population-based and pathway perspective.

The paper “Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions” is presented in Chapter Two. The aim of the study is to investigate in the Italian context whether the performance of university hospitals differ with respect to the results of general hospitals. Previous studies on this topic have reached mixed conclusions [Ananyan and Weissman 2002;
Kuppersmith 2005; Papanikolau et al. 2006]. As most studies were conducted in the USA [Clark and Tugwell 2006], there is scope for a focus on the specific Italian context, where evidence on this topic is lacking.

Based on a multidimensional perspective, this study provides evidence that Italian university hospitals do not perform as a specific cluster with respect to general hospitals. This suggests that the teaching medical system may benefit from increased competition and integration with the healthcare providers that show best results in specific care pathways and are in charge of organizing primary, community and home care, towards a less hospital-centred education. Hence, the paper provides insights on how performance evaluation systems in the Italian context (such as the Mes-Lab PES and the National Outcome Evaluation Programme) can inform the teaching status attribution based on a multi-dimensional performance comparison.

In Chapter Three, the second paper (“Patient satisfaction and outcomes in Italian university hospitals: a cross-sectional analysis”) is presented. This paper aims to provide evidence on how patient satisfaction should be taken into account not only as a relevant performance dimension by itself, but also due to its relation with other relevant dimensions, with a focus on outcomes. Secondly, the study aims to investigate in which care pathways this relation exists. University hospitals are the context where the association between patient satisfaction and outcomes is investigated.

Firstly, the paper suggests that the patients leaving against medical advice can be considered a proxy of patient satisfaction to be constantly monitored. Then, the study provides evidence of a positive association between this measure and the outcomes at the ward level. This evidence fosters the need to take into account patient perspective as an important source of information. Moreover, a significant association was found only for surgical care. This suggests that patient satisfaction determinants are different in these two hospital paths, as surgical activity often represents the “traditional” acute hospital care, whereas the hospital medical care can be increasingly considered a phase of a multi-provider, usually chronic, care path. In this sense, the study suggests that hospital performance of chronic and acute care paths should be analysed, evaluated and interpreted with different perspectives. In particular, in multi-provider care paths performance evaluation should foster a broader interpretation of results considering a pathway perspective.
The third paper (“Bridging the Gap between Theory and Practice in Integrated Care: The Case of the Diabetic Foot Pathway in Tuscany”) is presented in Chapter Four. The paper summarizes the experience carried out in Tuscany Region aimed at spreading integrated care in a multi-provider, multi-professional and multidisciplinary pathway: the diabetic foot care. The paper outlines the methods and tools used to encourage clinicians to implement actions towards integrated care.

In particular, the paper describes how performance evaluation can be used to enable a community of practice to discuss the determinants of geographic variation of performance in a multi-providers, multi-professional and multi-disciplinary care pathway and to identify integrated care solutions to be spread. In addition, the paper provides a focus on the increased barriers to internal and external integration and coordination faced by university hospitals, which were recognized as relevant determinants of poor results in this “integrated care” path.

§ 1.2.2. Snapshot of the Ph.D. papers

In the following table, some relevant details of the three papers are reported.
<table>
<thead>
<tr>
<th>Paper Aim</th>
<th>Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions</th>
<th>Patient satisfaction and outcomes in Italian university hospitals: a cross-sectional analysis</th>
<th>Bridging the Gap between Theory and Practice in Integrated Care: The Case of the Diabetic Foot Pathway in Tuscany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authors</td>
<td>Sabina Nuti, Tommaso Grillo Ruggieri, Silvia Podetti</td>
<td>Tommaso Grillo Ruggieri, Paolo Berta, Anna Maria Murante, Sabina Nuti</td>
<td>Sabina Nuti, Barbara Bini, Tommaso Grillo Ruggieri, Alberto Piaggesi, Lucia Ricci</td>
</tr>
<tr>
<td>Status</td>
<td>Published on BMJ Open in 2016&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Submitted to BMC Health Service Research</td>
<td>Published on International Journal of Integrated Care in 2016&lt;sup&gt;14&lt;/sup&gt;</td>
</tr>
<tr>
<td>Research Question</td>
<td>Do university hospitals (UHs) perform better than general hospitals (GHs)?</td>
<td>Is patient satisfaction associated with the patient leaving against medical advice (PLHAMA) rate? Is there an association with outcomes?</td>
<td>How to spread a best practice of integrated care?</td>
</tr>
</tbody>
</table>
| Background | Mixed results of previous literature, with differences methodologies, measures, contextual factors, etc. | - Increasing focus on patient perspective  
- Mixed results and debate about the relationship between patient satisfaction and quality/outcomes of care | - Presence of geographic variation among Tuscan Local Health Authorities in the diabetes-related lower-limb major amputation rate;  
- Integrated care is essential to improve diabetic foot outcomes. |


<table>
<thead>
<tr>
<th>Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions</th>
<th>Patient satisfaction and outcomes in Italian university hospitals: a cross-sectional analysis</th>
<th>Bridging the Gap between Theory and Practice in Integrated Care: The Case of the Diabetic Foot Pathway in Tuscany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data/cases</td>
<td>27 performance indicators compared for 15 UHs and 73 Local Health Authorities for the years 2012 and 2013</td>
<td>Patient satisfaction scores and PLHAMA rate at regional and hospital level; 30-day mortality and Patient Leaving against Medical Advice rates at ward level for 405 wards in 24 university hospitals</td>
</tr>
<tr>
<td>Methodology</td>
<td>Non parametric Mann-Whitney and Robust Equal Variance tests</td>
<td>Correlation and regression analyses</td>
</tr>
<tr>
<td>Contributions</td>
<td>- The study recommends a broader use of performance evaluation to integrate the teaching network among best practice hospitals in specific care pathways, towards a more integrated and less hospital-centred network of teaching institutions</td>
<td>- Performance evaluation can support managers in enhancing patient-centred care by providing insights on whether and in which care paths patient satisfaction is linked to other performance dimensions. The study suggests that: - Patient satisfaction determinants may be different in surgical and medical pathways; - Hospital performance of multi-provider care pathways should be assessed considering a pathway perspective.</td>
</tr>
</tbody>
</table>
§ 1.3. References

- Coulter A, Locock L, Ziebland S, Calabrese J. Collecting data on patient experience is not enough: they must be used to improve care. BMJ 2014;348. doi: http://dx.doi.org/10.1136/bmj.g2225.
- Coyte PC, Goodwin N, Laporte A. How can the settings used to provide care to older people be balanced?. European Observatory on Health Systems and Policies; 2008.


- Leutz W. Five laws for integrating medical and social services: lessons from the United States and the United Kingdom. The Millbank Quarterly 1999;77(1);77-110.


- Nolte E, Pitchforth E. What is the evidence on the economic impacts of integrated care?. European Observatory on Health Systems and Policies, 2014.


CHAPTER 2 - Do university hospitals perform better than general hospitals? A comparative analysis among Italian regions

ABSTRACT

Objective: The aim of this research was to investigate how university hospitals (UHs) perform compared with general hospitals (GHs) in the Italian healthcare system.

Design and setting: 27 indicators of overall performance were selected and analysed for UHs and GHs in 10 Italian regions. The data refer to 2012 and 2013 and were selected from two performance evaluation systems based on hospital discharge administrative data: the Inter-Regional Performance Evaluation System developed by the Management and Health Laboratory of the Scuola Superiore Sant’Anna of Pisa and the Italian National Outcome Evaluation Programme developed by the National Agency for Healthcare Services. The study was conducted in 2 stages and by combining 2 statistical techniques. In stage 1, a non-parametric Mann-Whitney U test was carried out to compare the performance of UHs and GHs on the selected set of indicators. In stage 2, a robust equal variance test between the 2 groups of hospitals was carried out to investigate differences in the amount of variability between them.

Results: The overall analysis gave heterogeneous results. In general, performance was not affected by being in the UH rather than the GH group. It is thus not possible to directly associate Italian UHs with better results in terms of appropriateness, efficiency, patient satisfaction and outcomes.

Conclusions: Policymakers and managers should further encourage hospital performance evaluations in order to stimulate wider competition aimed at assigning teaching status to those hospitals that are able to meet performance requirements. In addition, UH facilities could be integrated with other providers that are responsible for community, primary and outpatient services, thereby creating a joint accountability for more patient-centred and integrated care.
§ 2.1. Introduction

University hospitals (UHs) can be considered as complex organisations given that their mission includes three different objectives: patient care, education and research [1]. UHs combine all the features of Mintzberg’s Professional Bureaucracy [2] embedded within both the healthcare organisations and the university context. In addition, UHs are usually referral centres for most complex care within a hub-and-spoke hospital network [3]. Given the threefold mission of these institutions and the specific role that they play in the healthcare system, should UHs be considered as a ‘cluster’ with specific performance patterns?

This study investigates whether UHs behave homogeneously regarding performance results with substantial differences with respect to general hospitals (GHs).

Evidence on this topic could provide important information for policymakers and managers in defining specific policies and actions in order to improve the quality of care within the regional network of hospitals, where UHs play a specific and strategic role, and in order to pursue their specific mission.

In particular, in Italy as in other countries, UHs are in charge of the strategic role of training doctors of the future. Therefore, since health professionals are the most important assets for the healthcare organisations, policymakers should ensure that clinicians are trained and supported by institutions that can ensure the appropriate requirements in terms of quality of care and research productivity. The analysis was carried out in Italy.

§ 2.2. Background

Teaching status has been already investigated from several perspectives by studying whether it affects the results of UHs compared with other hospitals in terms of outcomes, quality of care, productivity, costs, etc.

First, reviews on outcomes, quality of care and prevention of adverse events reached mixed conclusions and highlighted the need for evidence on differences between UHs and GHs [4, 5]. Some reviews underlined better overall results for UHs [6, 7], whereas a systematic review highlighted no differences between UH and GH outcomes [8].
Second, studies on productivity and efficiency have usually applied Data Envelopment Analysis (DEA) and frequently highlighted better performance of GHs with respect to UHs [9, 10].

Indeed, training resident students carrying out research activities besides patient care and the role of referral centres for complex care have often been identified as elements that can increase costs [11-13]. This frequently drives additional financial resources to UHs (e.g., an increased mark-up in the reimbursement system for UH discharges) [6].

Research on this topic presents several differences in terms of data sources, measurement processes and methodology for data analysis [4]. This could raise potential issues regarding external validity and result generalisability [6-9]. Examples of these differences are:

- The data sources: for example, medical records or administrative data;
- The definition of UHs and their ownership (public, private, for-profit, non-profit): for example, some studies consider only major UHs, whereas others include all the hospitals with a residency programme;
- The indicators included in the analysis (usually outcomes, quality of care or efficiency) and the different calculation criteria and risk-adjustment procedure used for the same measures (mortality rates, process measures, etc);
- The statistical methods used to compare hospitals (parametric and non-parametric approaches and tests such as DEA, analysis of variance (ANOVA), Kruskal-Wallis, Mann-Whitney, etc).

These differences may partially explain why research looking at different performance or outcomes in UHs or controlling for a potential effect of the teaching status has not led to straightforward results.

Finally, results may be also associated with the specific geographical context. For instance, in one of the most recent systematic reviews on this topic, more than three-fourths of the studies included in the analysis were conducted in the USA [8]. However, each specific geographical and health system context may play an important role in explaining results.

With reference to Italy, detailed studies are also lacking on this topic. Scholars have focused on governance issues or research evaluations (see, for instance, refs.
There have been no systematic comparisons of performances between the two groups of hospitals and related research.

**The Italian context**

The national healthcare system in Italy follows a Beveridge Model by providing universal coverage through general taxation. Regional governments are responsible for organising and delivering health services and being accountable for performance. The national government monitors the pursuit of the universal coverage, in particular with respect to a package of essential services (nationally defined basic health benefit package —Livelli Essenziali di Assistenza). The national government allocates financial resources to the regional governments on an adjusted capitation basis. Regions then reallocate resources to Local Health Authorities (LHAs), through a regionally adjusted capitation formula.

In Italy, hospital care is delivered by public GHs directly managed by the LHAs, private or public autonomous hospitals (AHs), private or public UHs and research hospitals (RHs). AHs, UHs and RHs are autonomous organisations with respect to LHAs managing the healthcare delivery in their own geographical area.

UHs can be classified considering ownership and different institutional and organisational settings [18]. In Italy, the teaching status can be attributed to hospitals owned by private university medical schools, hospitals owned by public university medical schools and hospitals jointly owned by both public university medical schools and the regional administration. In this last case, the chief executive officer (CEO) is jointly appointed by the two institutions. Following the national laws (D.Lgs 502/92 and D. Lgs 517/99), these hospitals are identified as teaching facilities by the Ministry of Health, the Ministry of Education and the Regional Administrations. Regardless of the ownership and the organisational settings, health professionals employed by universities, besides teaching and carrying out research, also provide patients care and receive an additional 30% remuneration. These costs are directly sustained not by the universities but by the hospital administration.

Considering patient care activity, since UHs are autonomous authorities, they are not financed through capitation-based funding as the LHAs, but through different financing mechanisms depending on regional strategies.
At the national level, UH inpatient services delivered for residents of other regions are reimbursed considering a diagnosis related group (DRG) tariff increase of 7%.

At the regional level, UHs can be financed through a pay for service system based on DRG tariffs (e.g., Lombardy region) or through a budget-cost control system. In the first case, UH DRG tariffs are increased by a certain percentage (usually the 3% circa), depending on the case-mix delivered and the regional strategy. In the second case, as well as in other countries [19], regions usually assign additional resources to UHs through specific funds linked to education, research and complex care delivery (e.g., in Tuscany, the amount of these funds accounted for 30% of the UH overall budget). Therefore, UHs receive an additional amount of resources with respect to GHs, but this varies depending on the regional policies [14].

Italian UHs have on average a much higher number of hospital beds with respect to GHs and are referral centres for highly complex and highly specialised care, such as neurosurgery, cardiosurgery, radiotherapy, most critical intensive care, paediatric highly complex surgery, etc.

Evidence from Italy on the comparison of UH performance with respect to GHs may provide valuable information for both healthcare policymakers and managers, at both regional and national levels and not only in Italy. Indeed, if UHs behave as a specific ‘cluster’, new policies and focused actions could be defined to support the specific role of these authorities within the hospital network in the regional and national contexts. Evidence of similar patterns of performance between these two groups of hospitals may highlight the need to look for other sources of variation. Therefore, other features from the teaching and research status may be relevant to inform policies on hospital governance, financing and network organisation, considering the crucial role of UHs in training the future clinicians for the healthcare system.

The aim of this paper is thus to investigate how UHs perform in comparison to GHs.
§ 2.3. Methods

Data sources and hospital selection

The data used in this analysis were selected from two performance evaluation systems based on the same hospital discharge administrative database:

- The Inter-Regional Performance Evaluation System (IRPES) developed by the Management and Health Laboratory of the Scuola Superiore Sant’Anna of Pisa (MeS-Lab)—where the authors of this paper are researchers. This system provides a multidimensional evaluation of performance including efficiency, appropriateness, integration and quality of care. This system was first implemented by the regional government in Tuscany [20, 21] and was then adopted—on a voluntary basis—by the majority of other Italian regions\textsuperscript{15} [22, 23]. The evaluation process measures through benchmarking and with specific risk adjustment processes the results achieved every year by all the Health Authorities (the LHAs, the UHs, the RHs and the AHs) located in these regions. Results are publicly reported [24].

- The Italian National Outcome Evaluation Programme (NOEP) developed by the National Agency for Healthcare Services on behalf of the Ministry of Health. This system measures outcomes nationwide [25], that is, for each Italian hospital. On the basis of rigorous risk adjustment processes [26, 27], these measures represent assessment tools to support clinical and organisational audit programmes aimed at improving outcome and equity in the National Health Service.

Data refer to the years 2012 and 2013, apart from two economic indicators related to balance sheets, which are available only for 2011 and 2012.

Two groups of hospitals were considered in the analysis. The groups differed in particular in terms of whether they had teaching status, and in the organisational autonomy with respect to the LHAs. They also differed in terms of the average number of hospital discharges (in 2012, 32 632 for UHs and \textasciitilde 17 606 for GHs) and the average DRG weight (in 2012, 1.3 for UHs and 1.06 for GHs). The whole study included all the 15 UHs and 73 LHAs of the 10 IRPES regions.

\textsuperscript{15} The IRPES in 2014 included Basilicata, Emilia-Romagna, Friuli Venezia Giulia, Liguria, Marche, Autonomous Province of Bolzano, Autonomous Province of Trento, Toscana, Umbria, Veneto. In 2015 Lombardia, Calabria, Lazio, Puglia and Sardegna joined the network.
Performance indicators

For the purposes of this study, 27 performance indicators were selected, 10 from IRPES (table 1) and 17 from NOEP (box 1).

Eight IRPES indicators regard efficiency and appropriateness, patient satisfaction, and economic and financial dimensions. Two indicators regard economic and financial evaluation. This selection was shared by the group of IRPES regional representatives. This group is in charge of systematically reviewing and discussing the measures included in the IRPES as relevant proxies for measuring performance in a multidimensional perspective in all the different settings of care [22].

<table>
<thead>
<tr>
<th>Table 1 – IRPES Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency and appropriateness</strong></td>
</tr>
<tr>
<td>Relative stay index (case-mix adjusted differential average LOS days)</td>
</tr>
<tr>
<td>Percentage of medical discharges with LOS over the threshold for patients aged 65 and over</td>
</tr>
<tr>
<td>Percentage of ED green-coded patients visited within 1 hour</td>
</tr>
<tr>
<td>Percentage of ED patients referred for hospital admission with ED LOS≤8 hours</td>
</tr>
<tr>
<td>Percentage of medical inpatient discharges within 2 days (National Healthcare Agreement 2010)</td>
</tr>
<tr>
<td>Percentage of day case surgery for specific procedures (National Healthcare Agreement 2010)</td>
</tr>
<tr>
<td><strong>Patient satisfaction</strong></td>
</tr>
<tr>
<td>Percentage of patients leaving ED against/without medical advice</td>
</tr>
<tr>
<td>Percentage hospitalised patients leaving against medical advice</td>
</tr>
<tr>
<td><strong>Economic and financial evaluation</strong></td>
</tr>
<tr>
<td>Average cost per weighted case</td>
</tr>
<tr>
<td>Average expenditure per diagnostic imaging weighted for tariff</td>
</tr>
</tbody>
</table>

DRG, diagnosis related group; ED, emergency department; IRPES, Inter-Regional Performance Evaluation System; LOS, length of stay.
For both sources of the selected indicators, the time coverage and the number of providers needed to perform the statistical test were guaranteed, thus ensuring the consistency of the comparative analysis between the two groups of hospitals in this single-country study [28-29].

The number of observations for the NOEP indicators may differ because not all the hospitals included in the analysis provide all the healthcare services linked to the included measures. However, the selection of these measures took into account the services usually provided by both LHA-GHs and UHs.

The analysis for the IRPES indicators compared the 15 UHs to the 73 LHAs. On the other hand, the analysis for the NOEP indicators was carried out at the hospital level, thus comparing the (at most) 19 facilities of the 15 UHs to the individual (at most) 187 GHs led by the 73 LHAs (see supplementary appendix I for the complete list of hospitals considered and the number of observations included for each indicator16).

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16 Available at: http://bmjopen.bmj.com/content/6/8/e011426/DC1/embed/inline-supplementary-material-1.pdf
Statistical methods

The study was conducted in two stages and by combining two statistical techniques. Data were processed using Stata software, V.12. In stage 1, a non-parametric Mann-Whitney U test was carried out to compare the performance of UHs and GHs on the selected set of indicators. This analysis determines whether UHs and GHs were drawn from the same target population.

Previous studies have already applied this univariate analysis to illustrate differences between hospitals [30] because of its appropriateness with small samples [31-35]. For the purposes of this study, this test verified whether there were differences between UH and GH performance, or, in other words, whether UHs and GHs could be considered as two different clusters. In stage 2, we carried out a robust equal variance test to investigate differences in the amount of variability between UHs and GHs [36]. This test is usually used to verify the assumption of homogeneity of variance across groups, meaning that the internal variability of one group of hospitals is not significantly different with respect to the other one.

To be in line with the assumptions of the Mann-Whitney U test, we used an extension of Levene’s test as suggested by Brown and Forsythe [37]. We applied the test only for those indicators in which the Mann-Whitney U test did not show significant differences between UH and GH performances. Indeed, in those cases where the performance between the two groups did not show significant differences, we tested whether there were specific patterns in terms of variability.

§ 2.4. Results

The Mann-Whitney U test on IRPES indicators showed that in relation to four measures of ‘Efficiency and appropriateness’ and ‘Economic and financial evaluation’ dimensions, there were differences in performance between UHs and GHs. The test, in fact, was significant both in 2012 and 2013 for the ‘Percentage of emergency department (ED) green-coded patients visited within one hour’, the ‘Percentage of medical inpatient discharges within two days’ and the ‘Percentage of day case surgery for specific procedures (National Healthcare Agreement 2010)’. The test was significant also in 2011 and 2012 for the ‘Average expenditure for diagnostic
imaging weighted for tariff’. For these indicators, GHs seemed to perform better than UHs.

On the other hand, with reference to the indicators ‘Relative stay index’, ‘Percentage of medical discharges with length of stay (LOS) over the threshold for patients aged 65 and over’, and ‘Percentage of ED patient referred for hospital admission with ED LOS ≤ 8 hours’, the Mann-Whitney U test was rejected for both 2012 and 2013.

Moreover, no significant differences were found for patient satisfaction proxies ‘Percentage of patients leaving ED against/without medical advice’ and of ‘Percentage of hospitalised patients leaving against medical advice’. Moreover, in 2013, UHs accounted for fewer patients who were discharged against medical advice, whereas in 2012 the GHs achieved better results. The test was also not significant for the ‘Average cost per weighted case’ and this occurred also after deleting outliers.

Table 2 summarises the results of the test and illustrates the average and the median values of the two groups of hospitals for each of the indicators.

Regarding the test for the NOEP indicators, for all the tested measures, the Mann-Whitney U test was not significant except for two measures that showed mixed results in 2012 and 2013 (table 3) (in online supplementary appendix II, box plots for IRPES and NOEP indicators with significant differences between UHs and GHs are shown17).

For the ‘Congestive heart failure: 30-day mortality’, the test showed no statistical differences between UHs and GHs in 2012. However, a significantly better performance for UHs was found in 2013. Similarly, in the case of the indicator ‘Femur fracture: percentage of operations carried out within two days’, the Mann-Whitney U test showed significant differences between UHs and GHs in 2012, but not for 2013, with GHs having the best median performance.

In order to investigate different variations between the two groups of hospitals, the robust equal variance test [37] was carried out for a set of 23 indicators (6 IRPES indicators and 17 NOEP indicators) that rejected the Mann-Whitney U test.

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17 Available at http://bmjopen.bmj.com/content/6/8/e011426/DC1/embed/inline-supplementary-material-1.pdf
### Table 2 - Mann-Whitney U test for IRPES indicators

<table>
<thead>
<tr>
<th>Efficiency and appropriateness</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative stay index (case-mix adjusted differential average LOS days)</td>
<td>-0.2</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of medical discharges with LOS over the threshold for patients aged 65 and over</td>
<td>4.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Percentage of ED green-coded patients visited within 1 hour</td>
<td>73.1</td>
<td>68.4</td>
</tr>
<tr>
<td>Percentage of ED patients referred for hospital admission with ED LOS≤8 hours</td>
<td>98.8</td>
<td>96.2</td>
</tr>
<tr>
<td>Percentage of medical inpatient discharges within 2 days (National Healthcare Agreement 2010)</td>
<td>21.5</td>
<td>21.8</td>
</tr>
<tr>
<td>Percentage of day case surgery for specific procedures (National Healthcare Agreement 2010)</td>
<td>46.2</td>
<td>48.4</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>3.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Percentage of patients leaving ED against/without medical advice</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Percentage of hospitalised patients leaving against medical advice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic and financial evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average cost per weighted case</td>
<td>4.471</td>
<td>4.484</td>
</tr>
<tr>
<td>Average expenditure per diagnostic imaging weighted for tariff</td>
<td>1.4</td>
<td>1.4</td>
</tr>
</tbody>
</table>

*P-value < 0.05.

ED, emergency department; GH, general hospital; IRPES, Inter-Regional Performance Evaluation System; LOS, length of stay; UH, university hospital.
### Table 3 - Mann-Whitney U test for NOEP risk-adjusted indicators

<table>
<thead>
<tr>
<th>Outcome indicators</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Median</td>
</tr>
<tr>
<td>AMI: 30-day mortality</td>
<td>UH 9.8</td>
<td>GH 8.8</td>
</tr>
<tr>
<td>AMI without PTCA: 30-day mortality</td>
<td>UH 17.4</td>
<td>GH 15.5</td>
</tr>
<tr>
<td>AMI with PTCA within 2 days: 30-day mortality</td>
<td>UH 4.8</td>
<td>GH 4.1</td>
</tr>
<tr>
<td>AMI with PTCA after 2 days: 30-day mortality</td>
<td>UH 2.7</td>
<td>GH 2.4</td>
</tr>
<tr>
<td>AMI: 1-year mortality</td>
<td>UH 10.4</td>
<td>GH 11.1</td>
</tr>
<tr>
<td>AMI: MACCE after 1 year</td>
<td>UH 24</td>
<td>GH 24.8</td>
</tr>
<tr>
<td>Isolated aortic coronary bypass: 30-day mortality</td>
<td>UH 1.8</td>
<td>GH 1.9</td>
</tr>
<tr>
<td>Valvuloplasty or heart valve replacement:</td>
<td>UH 2.6</td>
<td>GH 3.7</td>
</tr>
<tr>
<td>30-day mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure: 30-day mortality</td>
<td>UH 8.4</td>
<td>GH 9.8</td>
</tr>
<tr>
<td>Ischaemic stroke: 30-day mortality</td>
<td>UH 9.4</td>
<td>GH 10.1</td>
</tr>
<tr>
<td>Ischaemic stroke: 30-day readmission</td>
<td>UH 11.1</td>
<td>GH 9.4</td>
</tr>
<tr>
<td>COPD exacerbation: 30-day mortality</td>
<td>UH 7.2</td>
<td>GH 8.7</td>
</tr>
<tr>
<td>COPD: 30-day readmission</td>
<td>UH 14.2</td>
<td>GH 15.6</td>
</tr>
<tr>
<td>Proportion of caesarean section</td>
<td>UH 19.9</td>
<td>GH 18.1</td>
</tr>
<tr>
<td>Femur fracture: 30-day mortality</td>
<td>UH 4.2</td>
<td>GH 4.8</td>
</tr>
<tr>
<td>Femur fracture: percentage of operations carried out within 2 days</td>
<td>UH 48.4</td>
<td>GH 54.4</td>
</tr>
<tr>
<td>Colon cancer surgery: 30-day mortality</td>
<td>UH 3.4</td>
<td>GH 3.9</td>
</tr>
</tbody>
</table>

*p-value < 0.05.
AMI, acute myocardial infarction; COPD, chronic obstructive pulmonary disease; GH, general hospital; MACCE, major adverse cardiac and cerebrovascular event; NOEP, National Outcome Evaluation Programme; PTCA, percutaneous transluminal coronary angioplasty; UH, university hospital.
### Table 4 - Robust equal variance test for IRPES indicators

<table>
<thead>
<tr>
<th>Efficiency and appropriateness</th>
<th>2012</th>
<th>2013</th>
<th>Higher variability in 2012</th>
<th>Higher variability in 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative stay index (case-mix adjusted differential average LOS days)</td>
<td>0.9</td>
<td>1.4</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Percentage of medical discharges with LOS over the threshold for patients aged 65 and over</td>
<td>1.7</td>
<td>2.0</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Percentage of ED patients referred for hospital admission with ED LOS≤8 hours</td>
<td>9.0</td>
<td>6.7</td>
<td>0.5</td>
<td>9.7</td>
</tr>
<tr>
<td>Patient satisfaction Percentage of patients leaving ED against/without medical advice</td>
<td>1.9</td>
<td>1.8</td>
<td>0.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Percentage of hospitalised patients leaving against medical advice</td>
<td>0.7</td>
<td>0.7</td>
<td>0.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Economic and financial evaluation**

<table>
<thead>
<tr>
<th>Average cost per weighted case</th>
<th>2011</th>
<th>2012</th>
<th>Higher variability in 2011</th>
<th>Higher variability in 2012</th>
</tr>
</thead>
</table>
| ED, emergency department; GH, general hospital; IRPES, Inter-Regional Performance Evaluation System; LOS, length of stay; UH, university hospital.
<table>
<thead>
<tr>
<th><strong>Outcome indicators</strong></th>
<th>2012 SD UH</th>
<th>2013 SD UH</th>
<th>2012 SD GH</th>
<th>2013 SD GH</th>
<th>W50 median</th>
<th>Pr&gt;F</th>
<th>2012 SD UH</th>
<th>2013 SD UH</th>
<th>2012 SD GH</th>
<th>2013 SD GH</th>
<th>W50 median</th>
<th>Pr&gt;F</th>
<th>Higher variability in 2012</th>
<th>Higher variability in 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMI: 30-day mortality</td>
<td>3.3</td>
<td>3.8</td>
<td>0.8</td>
<td>0.4</td>
<td>2.6</td>
<td>3.7</td>
<td>2.8</td>
<td>0.1</td>
<td></td>
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<td>GH</td>
<td>GH</td>
</tr>
<tr>
<td>AMI without PTCA: 30-day mortality</td>
<td>4.8</td>
<td>6.2</td>
<td>1.1</td>
<td>0.3</td>
<td>4.4</td>
<td>6.6</td>
<td>2.3</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GH</td>
<td>GH</td>
</tr>
<tr>
<td>AMI with PTCA within 2 days: 30-day mortality</td>
<td>1.4</td>
<td>1.9</td>
<td>2.1</td>
<td>0.2</td>
<td>1.8</td>
<td>2.1</td>
<td>0.4</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GH</td>
<td>GH</td>
</tr>
<tr>
<td>AMI with PTCA after 2 days: 30-day mortality</td>
<td>1.6</td>
<td>1.4</td>
<td>0.5</td>
<td>0.5</td>
<td>1.2</td>
<td>1.4</td>
<td>0.9</td>
<td>0.3</td>
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<td>UH</td>
<td>GH</td>
</tr>
<tr>
<td>AMI: 1-year mortality</td>
<td>1.9</td>
<td>4.4</td>
<td>5.6</td>
<td>0.02*</td>
<td>3.3</td>
<td>3.7</td>
<td>0.1</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GH*</td>
<td>GH</td>
</tr>
<tr>
<td>AMI: MACCE after 1 year</td>
<td>4.1</td>
<td>5.3</td>
<td>2.1</td>
<td>0.2</td>
<td>3.2</td>
<td>5.5</td>
<td>0.4</td>
<td>0.04*</td>
<td></td>
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<tr>
<td>Isolated aortocoronary bypass: 30-day mortality</td>
<td>1.4</td>
<td>1.6</td>
<td>0.0</td>
<td>0.9</td>
<td>1.6</td>
<td>1.4</td>
<td>0.0</td>
<td>0.9</td>
<td></td>
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<td>UH</td>
</tr>
<tr>
<td>Valvuloplasty or heart valve replacement: 30-day mortality</td>
<td>1.3</td>
<td>0.5</td>
<td>2.7</td>
<td>0.1</td>
<td>1.2</td>
<td>1.0</td>
<td>0.2</td>
<td>0.6</td>
<td></td>
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</tr>
<tr>
<td>Congestive heart failure: 30-day mortality</td>
<td>3.3</td>
<td>5.0</td>
<td>1.8</td>
<td>0.2</td>
<td></td>
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<td>UH</td>
<td>UH</td>
</tr>
<tr>
<td>Ischaemic stroke: 30-day mortality</td>
<td>2.9</td>
<td>4.5</td>
<td>5.9</td>
<td>0.02*</td>
<td>4</td>
<td>4.5</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
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<td></td>
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<td>GH*</td>
<td>GH</td>
</tr>
<tr>
<td>Ischaemic stroke: 30-day readmission</td>
<td>3.6</td>
<td>3.9</td>
<td>0.0</td>
<td>0.9</td>
<td>2.2</td>
<td>3.0</td>
<td>1.6</td>
<td>0.2</td>
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</tr>
<tr>
<td>COPD exacerbation: 30-day mortality</td>
<td>2.3</td>
<td>3.9</td>
<td>3.7</td>
<td>0.1</td>
<td>2.9</td>
<td>4.1</td>
<td>1.2</td>
<td>0.3</td>
<td></td>
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<td>GH</td>
<td>GH</td>
</tr>
<tr>
<td>COPD: 30-day readmission</td>
<td>2.4</td>
<td>4.5</td>
<td>5.9</td>
<td>0.02*</td>
<td>3.4</td>
<td>4.2</td>
<td>1.1</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GH*</td>
<td>GH</td>
</tr>
<tr>
<td>Proportion of caesarean section</td>
<td>9.1</td>
<td>7.1</td>
<td>1.3</td>
<td>0.3</td>
<td>9.2</td>
<td>7.2</td>
<td>1</td>
<td>0.3</td>
<td></td>
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<td></td>
<td>UH</td>
<td>UH</td>
</tr>
<tr>
<td>Femur fracture: 30-day mortality</td>
<td>1.3</td>
<td>2.2</td>
<td>5.2</td>
<td>0.02*</td>
<td>2.1</td>
<td>2.2</td>
<td>0.6</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GH*</td>
<td>GH</td>
</tr>
<tr>
<td>Femur fracture: percentage of operations carried out within 2 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16.7</td>
<td>18.1</td>
<td>0.8</td>
<td>0.4</td>
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<td>UH</td>
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</tr>
</tbody>
</table>

*p-value<0.05.
AMI, acute myocardial infarction; COPD, chronic obstructive pulmonary disease; GH, general hospital; MACCE, major adverse cardiac and cerebrovascular event; NOEP, National Outcome Evaluation Programme; PTCA, percutaneous transluminal coronary angioplasty; UH, university hospital.

Table 5 - Robust equal variance test for NOEP risk-adjusted indicators
Regarding IRPES indicators, the test was always not significant for both years included in the analysis (table 4). UHs and GHs showed a higher SD depending on the measures considered.

For the 2012 results of NOEP indicators, the test was significant for four measures (table 5):

- ‘Acute myocardial infarction (AMI): 1-year mortality’ (p value=0.02)
- ‘Ischaemic stroke: 30-day mortality’ (p value=0.02)
- ‘Femur fracture: 30-day mortality’ (p value=0.02)
- ‘Chronic obstructive pulmonary disease (COPD): 30-day readmission’ (p value=0.02)

In 2013, the test was significant only for the indicator ‘AMI: major adverse cardiac and cerebrovascular event (MACCE) after 1 year’ (p value=0.04). For these measures, GHs showed a higher SD with respect to UHs. This was also the case for most of the other outcome measures included for 2012 and 2013, apart from the ‘Proportion of caesarean section’ and the ‘30-day mortality rate for valvuloplasty or heart valve replacement’.

### § 2.5. Discussion

The overall analysis showed heterogeneous results when comparing the two groups of hospitals. Considering the IRPES indicators of appropriateness, we found a higher compliance of GHs in pursuing the Italian Ministry of Health standards on directing patients to the appropriate care settings for surgical treatments as well as in avoiding short medical hospitalisations and giving preference to outpatient clinics or day cases. This may be due to the lower complexity of general LHA-led hospitals and to a related lower complex management.

Regarding efficiency, in 2013, GHs seemed to perform better than UHs but these results are slightly different in 2012, thus leading to ambiguous conclusions. Therefore, the threefold mission and the greater organisational complexity of UHs seemed to lead to lower but not significantly different efficiency with respect to GHs. The more straightforward results in terms of the waiting times in ED may be due to the greater pressure in the UH EDs, which are usually located in city centres.
Although the differences between GHs and UHs were always not significant, in 2012 GHs accounted for higher patient satisfaction. These results changed in 2013. However, previous research focused only on the patient experience with hospital medical staff in Tuscany showing a higher patient satisfaction for patients discharged by UHs with respect to patients hospitalised in GHs (see, among others, ref. 38).

In addition, the test on variability for IRPES indicators showed homogeneous patterns of performance regardless of the teaching status. In particular, UHs showed a larger variation in the average cost per weighted case, which measures efficiency by comparing the average costs of inpatient cases weighted for the DRG complexity. This suggests that, as a group, UHs do not generally account for higher costs, contrary to what has been stated by other scholars [11-13] UHs, as individuals, show highly heterogeneous results. Hence, based on our analysis, the financial and economical sustainability of UHs could be related to the individual internal organisation or other factors rather than to the teaching status.

Finally, for the tested IRPES indicators and considering both the years considered in the analysis, a ‘cluster effect’ linked to the teaching status did not seem plausible.

This is also confirmed by the analysis on the NOEP indicators, which suggested that UHs did not generally achieve better outcomes. These results contribute to the research on this topic by suggesting that there is no straightforward evidence for better outcomes associated with UHs. Interestingly, GHs performed better (although not significantly) considering indicators related to the waiting time for femur fracture surgery and to the recourse to caesarean sections. In most of the mortality and readmission indicators, UHs did perform better but without a significant effect. Considering that UHs are referral centres with higher delivered volumes and patients, it is possible that these better results could also be explained by their role in the hospital network, rather than only by the teaching status, as suggested in other studies [39].

In addition, GHs account for a generally higher variability compared with UHs, but without significant differences. This means that although UHs seem to be generally more concentrated around average values, the extreme values of GH results towards the maximum and minimum of the distribution do not affect the overall analysis results. In conclusion, straightforward evidence identifying better
performance and less variability for UHs also does not seem plausible for NOEP indicators.

Summarising these results, from a multidimensional perspective being in the UH rather than the GH group does not generally affect performance. Hence, the different institutional and organisational settings between them do not seem to result in significant dissimilarities. Instead, the variations in hospital performance could be linked to particular features of each individual hospital or its managerial approach. Furthermore, these variations may also be determined by the Regional Healthcare System, rather than by a specific cross-regional group affiliation.

In Italy, there is evidence that hospital performance improvement may be affected by regional strategies combining different tools [22]. This is the case of the Tuscany and Basilicata regions, which applied a combination of different integrated governance tools and registered a higher performance improvement in the past years with respect to other regions. In fact, with reference to Tuscany, the regional UHs generally achieve a higher performance with respect to the UHs of the other IRPES regions [23-25, 40]. Nevertheless, the analysis of the impact of these regional strategies on performance of UHs needs to be investigated further.

As a preliminary study on this topic, this research presents some limitations. First, the study context focused on the Italian healthcare system and its organisational structure. We believe, however, that the contextual factors strongly influence the results. Therefore, these factors cannot be excluded when the research is aimed at supporting decision-making processes. This study provides evidence to enlarge the debate on this relevant topic in Italy and also in those countries aiming at linking teaching status attribution to performance evaluation. Second, there could be other indicators as valuable and informative as those measures included in the analysis. However, we included the ones that regional policymakers and healthcare managers in Italy share as valuable measures to assess and guide the system.

Further studies will investigate the relevance of individual and regional factors in affecting UH and GH results in this multidimensional perspective.
§ 2.6. Conclusions

The main finding of this study is that Italian UHs cannot straightforwardly be associated with better results in terms of appropriateness, efficiency, patient satisfaction, economic and financial evaluation, and outcomes. However, this preliminary evidence may inform the debate on the future role of UHs and encourage further considerations with regard to the Italian healthcare system.

First, if UHs wish to maintain their role of leading players in the hospital network and to be the main actors in charge of training clinicians of the future, hospital performance evaluations should be further encouraged in order to inform the attribution of teaching status based on performance results. This could stimulate wider competition between Italian hospitals aimed at assigning teaching status to those hospitals that achieve the best performance in specific care paths. In this respect, medical schools should base their teaching activities for both undergraduate and resident students in the hospitals that can ensure the best results and practices, since the future generation of clinicians has a crucial role in improving the quality of care.

Second, considering the pressure towards more population-based-oriented healthcare systems, the organisational structure of Italian UHs as an independent organisation could be revised towards a more integrated network with other facilities delivering community, primary and outpatient care. UH facilities could therefore be directly integrated with the other LHA-led providers also creating a joint accountability for more patient-centred care. In this perspective, in Italy, recent national legislation (Disegno di Legge n. 2111-B/2016) has allowed as a pilot experience the Special Administrative Regions (such as Friuli Venezia Giulia) to incorporate the UHs within the LHAs.

In conclusion, further studies on this topic will investigate whether performance of Italian UHs may be affected by regional strategies and systems of governance, such as the use of a transparent performance evaluation system.
§ 2.7. Reference


CHAPTER 3 - Patient satisfaction and outcomes in Italian university hospitals: a cross-sectional analysis

ABSTRACT

Background: Healthcare systems are increasingly focusing on patient experience as one of the main performance dimensions to be monitored. The availability of patient experience data has encouraged research exploring the relationship with other performance dimensions, such as outcomes. In Italy, an inter-regional performance evaluation system (IRPES) provides 13 Regional Healthcare Systems with a multidimensional assessment for appropriateness, efficiency, patient experience, financial sustainability, effectiveness, and equity. The rate of patient leaving against medical advice (PLHAMA) is one of the IRPES indicator. In addition, mortality rates at ward level are measured for the IRPES university hospitals. The paper aim is to examine the relationship between patient satisfaction (PS) and PLHAMA and the relationship between PLHAMA and outcomes at the ward level for the Italian university hospitals.

Methods: Correlation analyses were provided to investigate the association between PS and PLHAMA rates. Correlation and regression analyses were conducted to test the association between PLHAMA and mortality rates of IRPES university hospitals’ wards (n=405) linked to eight clinical specialties.

Results: Lower PLHAMA rates are associated with higher PS. Moreover, a positive association between PLHAMA, used as a proxy for PS, and mortality is showed at the ward level for IRPES university hospitals, with different results for medical and surgical clinical specialties.

Conclusions: PS is a relevant performance dimension whose evaluation provides managers and professionals with useful insights to improve care quality and effectiveness. PLHAMA rate can be regularly measured as a useful indicator to signal patient dissatisfaction. Moreover, PLHAMA is associated with other performance dimensions, such as outcomes. In particular, this relation proved to be significant for surgical services. In medical patient pathways, the PLHAMA rate may deserve a more complex analysis and interpretation, as for chronic diseases hospital care represents a single phase of a comprehensive multi-provider care path.
§ 3.1. Background

Healthcare systems are increasingly focusing on patient experience as one of the main performance dimension along with effectiveness, equity, efficiency and financial sustainability. Health organizations are therefore gathering and using patient-reported measures and including them in multidimensional performance evaluation systems with other measures (e.g. on outcomes, efficiency, quality, and equity) [1-9].

Regarding the Italian context, in 2004, the Management and Health Laboratory (Laboratorio Management e Sanità - MeSLab) of the Scuola Superiore Sant’Anna of Pisa developed a multidimensional performance evaluation system to compare and evaluate the results of the Health Authorities of the Tuscany Region [5]. Since 2008, year after year, an increasing number of Regions voluntarily adopted the MeSLab performance evaluation system, creating an inter-regional network [10]. In 2015, this network included 13 Regions (Basilicata, Calabria, Emilia Romagna, Friuli Venezia Giulia, Liguria, Lombardy, Marche, Autonomous Province of Bolzano, Autonomous Province of Trentino, Toscana, Puglia, Umbria and Veneto), and the inter-regional performance evaluation system (IRPES) measured in benchmarking the performance of their 167 Health Authorities. The IRPES results are publicly reported on a specific website [11] and through a printed annual report [12].

The IRPES includes indicators for appropriateness, quality, efficiency, equity, integration and continuity of care, and financial sustainability [12]. Only a few Regions include in the IRPES also staff satisfaction and patient satisfaction/experience of hospital care assessed through surveys, because they are time-consuming and they require additional human and financial resources.

All the Regions includes in the IRPES some measures tracking patient behaviours that are considered useful to estimate patient experience/satisfaction and that are easily calculated through administrative data: the patient leaving against medical advice (PLHAMA) rate and the percentage of patients leaving emergency department without being visited or against medical advice. Surveys on patient experience (based on the same framework in order to ensure comparability) were conducted in Tuscany (every 2 years since 2006), Friuli Venezia Giulia (in 2016) and Basilicata (in 2015-2016).
Moreover, in 2015, after that the Lombardy Region joined the IRPES, the MeSLab, in collaboration with the CRISP (Centro di Ricerca Interuniversitario per i Servizi di Pubblica utilità - research laboratory of the Bicocca University in Milan) proposed to all the inter-regional network the methodology to assess hospital effectiveness at the ward level already developed in Lombardy Region [13].

For this purpose, since 2015, the Regions share the information of patient and ward characteristics to calculate and benchmark risk-adjusted outcomes at the clinical specialty and ward levels, including PLHAMA and mortality rates.

The methodology provides risk-adjustment process through a multilevel regression model that, unlike standard regression models, allows to control for the existence of intra-hospital correlation (which considers patients within a hospital more similar in terms of experienced outcome than patients in different hospitals). Therefore, the CRISP-MeSLab database allows to investigate the relationship between different performance dimensions, such as patient satisfaction, estimated through the PLHAMA rate, and outcomes. In this sense, some authors hypothesized that PLHAMA can be used as proxy for patient satisfaction [7]. Indeed, a negative hospital experience can affect patient behaviour so strongly that the patient may decide to leave hospital against medical advice [14].

The aim of this work is to investigate in the Italian university hospitals (i) the relationship between patient satisfaction and PLHAMA and (ii) the association between PLHAMA and outcomes. This study investigates the second relationship also at the clinical specialty and ward levels in order to examine differences between inpatient pathways. University hospitals (UHs) can be considered a proper environment to test these associations because they are large hospitals and referral centres for complex care.

This paper suggests that, in the first place, hospital management should take into account patient perspective through proxies of satisfaction and routinely monitor it. These figures can be integrated with more sophisticated tools, such as surveys, that help hospital managers to deepen the comprehension of patient satisfaction determinants.

Nevertheless, these proxies of satisfaction can provide useful information, in particular considering their relationship with other performance dimensions, such as outcomes. The evidence of this study also contributes to the debate on whether and
in which contexts patients are able to assess the efficacy and quality of care they receive [see for example 9, 15-19].

**Patient-Reported Measures**

Patient-reported measures are widely used and collected (in some countries on a systematic basis) as relevant elements of health service quality to assess patient satisfaction, experience and perceived outcomes [1-5, 7-9].

In the USA, the Hospital Consumer Assessment of Healthcare Providers survey assesses Medicare hospital quality through patient perspective. The 25% of the pay-for-performance program “Hospital Value-Based Purchasing” is based on these results. In UK, patient perspective is considered a relevant source of information to guide debate, patient choice and research [3, 4, 20]. Several surveys are regularly conducted with a focus on: inpatient and outpatient services, emergency care, community mental care, maternity care, primary care, social care, etc. However only a few providers use these data to promote improvement strategies [4].

In Italy, there are two significant systematic assessments of patient perspective. At the national level, a population survey is administered every two-three years by the National Institute of Statistics on the experience of access to health services. The Institute provides results for each aggregate Regional Healthcare System [21]. At the regional level, MesLab conducts for the Tuscany Healthcare Service several systematic surveys on patient experience with hospital, emergency department, primary care practice, and maternity care services. Results are used to evaluate the Health Authority performance, to assign rewards to Health Authority CEOs and to verify the achievement of quality standards within the regional accreditation system.

These surveys provide valuable examples of how patient-reported measures can be used to improve healthcare services, despite the debate on whether patients are able to directly assess the quality of care they receive [15-19] and resistance from both clinicians and managers [4].

**Outcomes and PS**

The availability of patient satisfaction/experience data has stimulated research on its relationship with other performance dimensions, such as outcomes.
Indeed, previous studies have investigated this relation, reaching mixed results and conclusions [9, 15-19, 22-25]. A systematic review of patient experience, clinical safety and effectiveness summarized the existence of an overall positive relationship between these three pillars of quality of care [22].

Regarding in particular mortality outcome measure and patient satisfaction, Glickman and colleagues observed higher PS score associated with lower inpatient mortality among patients with acute myocardial infarction and suggested that patients were able to discriminate the type of care they received [23]. Jah and co-authors reported significantly higher PS in hospitals that delivered better quality of care considering measures for acute myocardial infarction, pneumonia, congestive heart failure and surgery [24].

With particular regard to surgical activity, Kennedy and colleagues observed that low inpatient mortality, large hospital size, and high surgical volumes were associated with high overall hospital patient satisfaction [25]. On the contrary, Fenton and colleagues observed that patients reporting higher satisfaction (in particular, with physician communication) had higher healthcare expenditure, higher drug expenditure, lower emergency department and greater inpatient utilization, and a higher risk of dying [17].

To the best of our knowledge, evidence on this relationship is lacking for the Italian context, even if there is increasing availability of systematically collected and published data on patient satisfaction [7, 21] and outcomes (in particular, from the National Outcome Evaluation Program [26]).

**PLHAMA, PS and outcomes**

Dissatisfaction in the healthcare experience may drive patients, for example, to leave hospitals against medical advice. Hwang and colleagues stated that dissatisfaction with treatment received is one of the most commonly cited reasons for leaving hospital against medical advice [14]. In addition, Murante and colleagues observed that patients with higher satisfaction with hospital care and doctor relationship have been cared in hospitals with lower PLHAMA rates [7].

These results suggest that the PLHAMA indicator is able to catch the inability of health services to meet patient needs. Consequently, it may be used as an indirect measure of patient satisfaction/experience.
In addition, some authors reported an association between PLHAMA and outcomes, such as mortality [27-30]. The aim of these studies was to show the risks associated with a non-conventional discharge or the predictors of PLHAMA, which were generally investigated considering clinical and socio-demographic factors [29] and not the patient satisfaction/experience perspective.

The study

Based on the above evidence and debates, the authors conclude that there is room to investigate whether patient satisfaction can be related to PLHAMA (as suggested by some authors [7, 14]) and whether PLHAMA is associated with outcomes (e.g. mortality rates) in the Italian context. Results may contribute to the debate in the research field that investigates the relationship between quality and patient satisfaction and provide insights for further studies.

§ 3.2. Methods

Firstly, in order to test the association between patient satisfaction and the PLHAMA rate, data at the regional level are analysed, considering the results in the national patient satisfaction survey of the 13 IRPES Regions and the PLHAMA rate included in the IRPES. Based on the published data of the population survey administered by the National Institute of Statistics, regional patient satisfaction scores were collected through the answers to the question “Overall, how do you rate your local health service?”. The regional PLHAMA rates were extracted from the IRPES.

The relationship between PS and PLHAMA was also investigated through a Spearman correlation test at the interdisciplinary clinical directorate (i.e. organizational hospital aggregation of specialties aimed at sharing technical resources) level, using the Tuscan survey on patient hospital experience administered by MeSLab. The patient survey data used for this test refers to a random and stratified sample of patients discharged from Tuscan hospitals during a two-month period across 2013 and 2014. The sample does not include patients hospitalized in an intensive care unit or for long-term care and patient died during or after the hospital access. Interviews were conducted by means of the Computer
Assisted Telephone Interviewing technique, in order to reach groups of patients with a low literacy status [31]. The questionnaires covered relevant elements of patient experience/satisfaction (patient-doctor and patient-nurses relationships, communication process, overall evaluation of care, etc). PS scores were collected through the answers to the survey question “Overall, how do you rate the delivered service?”.

The association between PLHAMA and outcomes was investigated using the information in the CRISP-MeSLab database. Data were gathered through the standardized hospital discharge administrative database and through the regional mortality database.

For the first application of the CRISP-MeSLab outcome evaluation, the IRPES Regions shared data at ward level for eight clinical specialties (five surgical specialties and three medical specialties) of their university hospitals: General surgery, Cardiac surgery, Neurosurgery, Orthopaedics and Traumatology, Urology, Internal Medicine, Cardiology, and Neurology.

Choosing UHs preserved from the bias of some confounders not included that could have been present by including other not large hospitals in the study: collinearity between high volume, hospital size and teaching status.

The database included data at the ward level for the 24 university hospitals of the IRPES Regions that have been participating in the CRISP-MeSLab outcome evaluation since 2015: Lombardy, Tuscany, Emilia-Romagna, Friuli Venezia Giulia, Veneto, Liguria, Marche, and Umbria.

For each ward, we calculated the PLHAMA rate and the all-cause 30-day mortality rate (considering both inpatient mortality and mortality occurred within 30 days after the discharge). This outcome was selected because it represents a relevant indicator to assess hospital care efficacy [32, 33].

For each ward, the PLHAMA rate measured the number of discharges against medical advice among the overall discharges. In order to exclude the potential bias of PLHAMA linked to end-of-life paths (i.e. in case of early discharges against medical advice when patients or their families prefer to receive end-of-life care at home), the voluntary discharges followed by the patient death within 2 days were not considered in the PLHAMA rate. Patients less than 2 years old were excluded. For both the PLHAMA and the mortality rates, we only considered the ordinary (longer than one-day) hospitalizations delivered in 2014 for residents in the regions where
each university hospital is located. When a patient was hospitalized in only one of
the ward included in the analysis and then discharged by an intensive or a cardiac
intensive care unit, the mortality or the PLHAMA eventually occurred during the
inpatient pathway were considered in the PLHAMA and mortality rates of the ward
that admitted the patients. This allowed to take into account in the two measures
of each ward also PLHAMA and mortality occurred to patients discharged by an
intensive care department but treated in one of the ward included in the analysis.
Finally, we included the wards with at least 100 discharges per year.

The CRISP-MeSLab database also included some variables, as illustrated in Table
N.1, to assess patient complexity. These variables allowed to investigate the
association between PLHAMA and mortality by controlling for relevant confounding
factors.

<table>
<thead>
<tr>
<th>Table 1 - Patient Complexity variables in CRISP-MeSLab database</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Intensive Care passage</td>
</tr>
<tr>
<td>Sentinel event</td>
</tr>
<tr>
<td>DRG weight</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>Elixhauser comorbidity index</td>
</tr>
</tbody>
</table>

Table N.1 - Patient Complexity variables in CRISP-MeSLab database

First, to test the association between the gross PLHAMA and mortality rates,
the Spearman Correlation test was carried out.

In order to further investigate the association between mortality and PLHAMA,
a standard regression model was applied. This model was estimated in order to
evaluate the relationship between gross mortality and PLHAMA rates at the ward
level by adjusting for patient complexity with the variables illustrated in Table N.1. The model included: the average ward index of patient comorbidity; the average ward patient age; the average ward DRG weight; the percentage of patients discharged by the ward admitted or transferred to an ICU/CICU; the ward percentage of patients with a cardiovascular disease; the ward percentage of female patients; and the ward percentage of patients with a sentinel event/urgent case.

Three different log-log model strategies were applied with an increasing number of covariates. Firstly, a simple model (MODEL-1) was estimated, including patient/ward characteristics and the PLHAMA rate at the ward-level. Secondly, eight fixed effect for the eight clinical specialties were included to control for the specialty effect (MODEL-2). Finally, an interaction between the specialty fixed effects and the PLHAMA rate at the ward level were included (MODEL-3). The first model allows to verify the significance of the relationship between mortality and PLHAMA adjusting for the patient/ward characteristics. With the second model, we controlled whether the association between mortality and PLHAMA was confirmed after the specialty fixed effect inclusion. Finally, we evaluated with MODEL-3 whether the relationship between PLHAMA and mortality was different over the specialties. Data were processed using Stata Software, version 12.

§ 3.3. Results

PLHAMA and PS

At the regional level, PLHAMA rate and patient satisfaction was significantly and negatively associated (Spearman’s rho: -0.6419, p-value<0.02), highlighting that higher PLHAMA were registered in Regions with lower overall patient satisfaction. The analysis based on Tuscany patient experience survey confirmed the relationship also at the interdisciplinary clinical directorate level: indeed, in Tuscany, the interdisciplinary clinical directorates (n=100) with better evaluations in terms of PS showed significantly lower PLHAMA rates (Spearman’s rho=-0.5102, p-value<0.001).

PLHAMA and outcomes

The CRISP-MeSLab database included 405 wards for the eight clinical specialties considered in the analyses. The two strategies (the Spearman Correlation test and
the regression model) provided similar results, confirming the positive and significant relationship between mortality and PLHAMA, in particular for some surgical specialties.

Firstly, the Spearman Correlation test for the whole set of wards showed a positive and significant relation between the two rates (p-value<0.01).

<p>| Table n. 2 - Spearman Correlation test for PLHAMA and mortality rates (**p-value&lt;0.01, *p-value&lt;0.05) |
|----------------------------------------------------|----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Number of wards</th>
<th>Spearman’s Roh</th>
</tr>
</thead>
<tbody>
<tr>
<td>All departments</td>
<td>405</td>
</tr>
<tr>
<td>Surgical Specialties</td>
<td>229</td>
</tr>
<tr>
<td>Medical Specialties</td>
<td>176</td>
</tr>
<tr>
<td>Surgical specialties</td>
<td></td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td>21</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>24</td>
</tr>
<tr>
<td>Urology</td>
<td>32</td>
</tr>
<tr>
<td>Orthopaedics &amp; Traumatology</td>
<td>51</td>
</tr>
<tr>
<td>General Surgery</td>
<td>101</td>
</tr>
<tr>
<td>Medical specialties</td>
<td></td>
</tr>
<tr>
<td>Cardiology</td>
<td>37</td>
</tr>
<tr>
<td>Neurology</td>
<td>33</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>106</td>
</tr>
</tbody>
</table>

Table n. 2 - Spearman Correlation test for PLHAMA and mortality rates

This positive relation was confirmed when we separately considered the 229 wards of the surgical disciplines (p-value<0.01). When separately testing for each individual specialty, the correlation between PLHAMA and mortality was positive and significant for Orthopaedics & Traumatology (p-value<0.01), General Surgery (p-value<0.01) and Neurosurgery (p-value<0.05) wards.

On the contrary, an overall significant association was not observed for the whole set of medical wards and when considering separately each specialty (Cardiology, Neurology and Internal Medicine).

Results of the regression models are showed in Table N.3.
The model including only the patient/ward characteristics (MODEL-1) showed a positive and significant relationship between PLHAMA and mortality. In MODEL-2, we included the specialties fixed effects. Result concerning the coefficient of PLHAMA did not change its significance, even though the magnitude decreased. In column MODEL-3, the interaction between PLHAMA and specialties was included.
This allowed to understand whether there was a different relationship between PLHAMA and mortality depending on the type of specialty. In order to analyse these results, we calculated the marginal effects of the interactions, whose results are illustrated in Table N.4.

| Specialty                       | Marginal Effects (dy/dx) | Standard Error | Z       | P>|z|   | 95% Conf. Interval |
|---------------------------------|--------------------------|----------------|---------|-------|---------------------|
| Cardiac surgery                 | 0.0087                   | 0.1744         | 0.05    | 0.96  | -0.334              | 0.351                |
| Cardiology                      | -0.1152                  | 0.1196         | -0.96   | 0.336 | -0.350              | 0.120                |
| General Surgery                 | 0.3399                   | 0.0665         | 5.11    | 0.000**| 0.209               | 0.471                |
| Internal Medicine               | -0.0241                  | 0.0829         | -0.29   | 0.771 | -0.187              | 0.139                |
| Neurosurgery                    | 0.2905                   | 0.1442         | 2.01    | 0.044*| 0.007               | 0.574                |
| Neurology                       | -0.0043                  | 0.1150         | -0.04   | 0.97  | -0.230              | 0.222                |
| Orthopaedics and Traumatology   | 0.5833                   | 0.0912         | 6.39    | 0.000**| 0.404               | 0.763                |
| Urology                         | 0.1316                   | 0.1301         | 1.01    | 0.311 | -0.124              | 0.387                |

Table N. 4 - Marginal effects of the interactions included in the model

General Surgery, Neurosurgery and Orthopaedics & Traumatology specialties presented a significant positive relationship between PLHAMA and mortality. This means that there is an overall positive relationship in the models, as showed in columns MODEL-1 and MODEL-2 in Table N.3, as well a specific relationship in some surgical departments. However, we did not observe the same relationship in the medical wards.

These results do not seem biased by some potential distortions. Firstly, by excluding the PLHAMA of patients died within 2 days after discharge, we avoided the potential bias linked to patient end-of-life pathways. Furthermore, through the risk-adjustment provided in the regression model, we took into account the patient complexity of each ward. By excluding the patients living in a different Region, we avoided the potential bias caused by patients that leave hospital against medical advice because they prefers to be admitted to the referral hospital in their own region of residency.
§ 3.4. Discussion

This study showed an association between patient satisfaction and PLHAMA, and between PLHAMA and 30-day mortality.

Based on this evidence, PLHAMA may be interpreted as the result of poor patient satisfaction, as suggested by other scholars [7, 14]. The expected association between the two phenomena was confirmed. We thus provided some evidence that PLHAMA can be used as a proxy for PS.

Therefore, PLHAMA rate should be routinely measured and used by healthcare managers and professionals to assess PS besides other tools (e.g. questionnaires). The PLHAMA measure is usually available in administrative data and can be easily and regularly monitored and compared across and within Regions, hospitals and wards. We therefore suggest its inclusion in performance evaluation systems whose aim is to benchmark healthcare systems and providers with a multi-dimensional perspective.

By using PLHAMA as a proxy for PS, we showed a positive relationship with outcomes, in particular regarding surgical wards. Hence, performance evaluation systems, hospital managers and professionals should constantly monitor the PLHAMA rate as an alert measure, which can signal potential sentinel events and issues linked to both patient satisfaction and outcomes.

Results indicate that patient satisfaction is higher in the wards that show better outcomes. Hence, this preliminary evidence for the Italian context suggests that there is no trade-off between PS and efficacy: patients seem capable of discriminating the quality of care they receive, as suggested by other authors [15, 18], notwithstanding the informative asymmetry in patient-doctor relationships.

This was particularly observed considering the services delivered by the surgical wards.

We suggest that the different results with respect to medical pathways can be rooted in the different determinants of patient satisfaction [35] and the evolving role of hospital care in medical and surgical inpatient pathways. Indeed, in the evolving healthcare scenario, the role of the hospitals is rapidly changing along with the epidemiological context [36].

The surgical inpatient activity (especially elective surgery) can be still considered the “traditional” hospital acute care service, because surgical
interventions are expected to be crucial for patient recovery: the most relevant care phases are expected to end with the patient discharge. On the contrary, in Italy, as in other countries, medical inpatient services in most cases should be considered a phase within a multi-provider chronic disease path. These care paths require multidisciplinary and multi-professional work and continuity and integration of care both within and outside the hospital. Hence, in these complex pathways, patient satisfaction is not just related to the care provided in the medical ward but can be related to the comprehensive care provided along the multi-provider path.

In surgical pathways, patient expectations may be instead related to relevant and detectable elements of the specific hospital ward activity, such as the respect of patient preferences through shared patient-doctor decision-making, timeliness of surgery, and health status during the post-operative phase. In these care paths, patients may be more capable of evaluating the quality and efficacy of the inpatient activity in the specific ward, as most of the relevant phases are provided within the hospital walls.

In this sense, patient satisfaction in surgical pathways may be the result of the alignment of more detectable patient expectations and the ward inpatient activity, whereas this relation may be more complex in medical pathways.

Moreover, patient dissatisfaction with hospital care in medical wards may not result in a voluntary discharge because it can be more difficult to find alternatives to hospital stay in other care settings. Indeed, hospital care in some cases is the only available option, even when it may not be considered the most appropriate care setting. In particular, this can occur in pathways of elderly patients experiencing a reduction in the traditional informal care provided by relatives at home and therefore related to difficult discharge processes.

This suggests also that both research and hospital performance evaluation should take into account the differences between surgical and medical multi-provider care paths when interpreting the results, with particular regard to chronic disease pathways. Indeed, performance in medical care paths should be increasingly evaluated considering with a multi-provider, multi-professional and multidisciplinary pathway perspective, without focusing on the individual hospital phase.

As a preliminary study on this topic, this study shows some limitations. Firstly, results are limited to the medical and surgical departments included in the analysis. However, these clinical specialties deliver a high share of the overall ordinary
hospitalizations in IRPES UHs (e.g. in Tuscany UHs, these specialties deliver the 50% circa of the overall hospital discharges). This study is also limited to the Italian context. However, contextual factors are relevant elements in the studies that aim to provide managerial and policy recommendations.

Further research will strengthen the evidence of this study by adding data of other IRPES Regions that are carrying out surveys on hospital patient satisfaction/experience (Tuscany, Friuli Venezia Giulia and Basilicata). Regional and hospital effects will be furtherly investigated by systematically including also non-teaching hospitals in the CRISP-MeSLab database.

§ 3.5. Conclusions

This study highlights the need to take into account patient satisfaction as a relevant dimension of performance whose measurement and evaluation can provide managers and professionals with useful insights to improve care quality and effectiveness.

In this regard, it is important to provide managers and professionals with measures that highlight issues in terms of PS, especially when tools such as surveys cannot be carried out.

In this sense, we provided some evidence that the PLHAMA rate can be regularly used as a useful measure to signal patient dissatisfaction. In particular, this relation proved to be more robust in surgical services. In medical patient pathways, the PLHAMA rate may deserve a more complex analysis and interpretation, as the hospital care represents in chronic diseases just a single phase of a comprehensive multi-provider care path.

Finally, this study suggests that PS deserves increasing attention not only as a specific goal for healthcare organisations, but also because of its potential association with other performance dimensions, such as effectiveness. Indeed, the increasing availability of published data and measures on outcomes in performance evaluation systems should encourage to further investigate the association between these two relevant performance dimensions. In particular, research may provide growing evidence on whether poor patient satisfaction can result in undesired patient behaviour (such as leaving hospital against medical advice) and whether and
in which contexts and pathways it may be liked to poor outcomes, indicating that patients may actually assess the quality of care they receive.

§ 3.6. References


ABSTRACT

Introduction and Background: As diabetic foot (DF) care benefits from integration, monitoring geographic variations in lower limb Major Amputation rate enables to highlight potential lack of Integrated Care. In Tuscany (Italy), these DF outcomes were good on average but they varied within the region. In order to stimulate an improvement process towards integration, the project aimed to shift health professionals' focus on the geographic variation issue, promote the Population Medicine approach, and engage professionals in a community of practice.

Method: Three strategies were thus carried out: the use of a transparent performance evaluation system based on benchmarking; the use of patient stories and benchmarking analyses on outcomes, service utilization and costs that cross-checked delivery- and population-based perspectives; the establishment of a stable community of professionals to discuss data and practices.

Results: The project enabled professionals to shift their focus on geographic variation and to a joint accountability on outcomes and costs for the entire patient pathways. Organizational best practices and gaps in integration were identified and improvement actions towards Integrated Care were implemented.

Conclusion and Discussion: For the specific category of care pathways whose geographic variation is related to a lack of Integrated Care, a comprehensive strategy to improve outcomes and reduce equity gaps by diffusing integration should be carried out.
§ 4.1. Introduction

Although many countries aim for more Integrated Care within and across institutional boundaries as a means of developing more cost-effective health services [1-4], this often fails because of established working patterns.

As good outcomes for the Diabetic Foot (DF) pathway depend on the involvement of several clinicians across different care settings and institutions, this pathway is an exemplar of the benefits of integration. Despite international recommendations to diffuse multi-disciplinary teams and integrated paths in order to improve DF outcomes [5-13], various factors are needed to achieve Integrated Care in the pathway organization.

This study contributes to the debate on how to implement Integrated Care [14-16] and bind together the research fields on the relevance of the epidemiological surveillance of medical care [17-24] and the public reporting of performance [25-30].

The paper describes the successful implementation of a combination of strategies aimed at spreading Integrated Care within the DF pathway in Tuscany (central Italy). The objectives linked to specific strategies are to:

– encourage clinicians to focus on the geographic variation issue;
– spread the Population Medicine perspective;
– engage clinicians in a stable community of practice in order to identify gaps in integration and practical models of Integrated Care [31, 32].

§ 4.2. Background

The Diabetic Foot Pathway in Tuscany

Tuscany is a region in central Italy with approximately 3.7 million inhabitants. Its regional healthcare system follows the Beveridge model and provides universal coverage with an annual public budget of €6.6 billion.

Twelve local health authorities (LHAs) are responsible for organizing and providing comprehensive healthcare services for an average of approximately 300,000 inhabitants. Hospital care is provided by general hospitals led by LHAs and three teaching hospitals (THs), which are independent health authorities (HAs)
without a specific geographic catchment area and regional referral centres for complex care.

Since 2004, the regional government in Tuscany has entrusted the “Management and Health Laboratory” (MeS-Lab) of the Scuola Superiore Sant’Anna University with the design and management of a multi-dimensional healthcare performance evaluation system (PES) [33-35]. Using systematic benchmarking, the PES compares the results of the twelve LHAs and the three THs in Tuscany considering 130 indicators. Since 2008, the PES has also included other Italian regions for systematic inter- and intra-regional comparisons [35]. Data are published on http://performance.sssup.it.

In 2012, the Tuscany Regional Government entrusted the MeS-Lab to design and coordinate an action plan to reduce the variation in DF outcomes by disseminating Integrated Care. The Italian National Outcomes Evaluation Programme [36] showed in 2012 that DF outcomes vary across regions and local areas (Figure 1).

![Figure 1: Age- and gender-adjusted hospitalization rates for diabetes-related lower limb amputations (major and minor) per 100,000 residents in the Italian Regions and Provinces - 2012. Source: National Outcome Evaluation Program - National Agency for Regional Health Services](image)

Despite Tuscany performed well compared to the other regions, there were considerable internal variations among its Provinces. This variability across and within regions suggested potential differences in implementing international guidelines, leading to unwarranted geographic variations, i.e. variations not dictated
by the needs of populations and patient preferences [17-24]. Such variations ought to be remedied within those healthcare systems aimed at reducing equity gaps (as in the case of the Italian Beveridge model) [21, 23, 24].

The Regional Government also chose the DF pathway because of the increasing:
- Incidence of DF complications, i.e. the first cause of lower-limb amputations in industrialized countries [9, 37];
- social and financial costs of DF patients who have had major amputations. DF care is associated with high additional costs of diabetes care for patients and healthcare systems [38, 39].
- the importance of assessing the overall quality of care in terms of the rate of diabetes-related lower limb major amputation, which is an indicator of poor quality and poor coordination within the overall service chain, which should trigger further investigations [40, 41].

The definition of Integrated Care and the Diabetic Foot Pathway

Integrated Care covers a rich conceptual framework with many theoretical definitions [1-4, 42-51], and different categories, breadth and degree.

Kodner [3] proposed six categories of integration:
- functional integration as the coordination between back-office and support functions across all units;
- organizational integration as the relationships between healthcare organizations;
- professional integration as the provider relationships within and between organizations;
- service or clinical integration as the coordination of services and the integration of care in a single process across time, place and discipline;
- normative integration as the shared mission, work values and organizational/professional culture;
- systemic integration as the alignment of policies and incentives at the organizational level.

Valentijn and colleagues described also three different levels of integration [46]: macro-level integration operates across sectors; meso-level integration operates both within and between organizations in order to diffuse collective actions across the entire care continuum overcoming cultural, professional and bureaucratic
boundaries; micro-level integration operates between clinicians and the individual patient in order to enforce the continuity of care and meet patient needs, regardless of specific organizational functions or structures.

In terms of breadth, integration between different organizations is known as vertical integration and the coordination of similar units.

Leutz described three configurations based on the intensity (i.e. degree) of the connections between organizations and units [50]: linkage, coordination and full integration. Linkage promotes the continuity of care for the individual patient through existing and autonomous organizations with adequate communication and referrals to match services with patients’ needs. Coordination ‘identifies points of friction, confusion, or discontinuity between systems and establishes structures and processes to solve these problems’ [50, p. 85] (e.g. increasing information-sharing, managing transition of care between settings). Full integration operates when a new accountable entity is established by pooling resources, rather than improving the coordination of the existing units.

The DF pathway involves all the settings of care, from community-based nursing clinics and primary care units, to highly-complex hospital departments (e.g. vascular surgery), often belonging to different organizations and institutions.

Based on the organization of the Tuscany Healthcare System and the conceptual framework of integration, in this study we identify the need for integration between different:

- units within the same organization (e.g. departments within a hospital);
- care settings (e.g. LHA primary care units and LHA-led hospitals)
- institutions (e.g. LHA nursing clinics and Teaching Hospitals).

With particular regard to normative integration, we considered the Population Medicine approach as the set of values that should inform professional behaviors so as to connect all the units, care settings, and organizations involved into DF care. Gray proposes the Population Medicine approach [53] as a means of encouraging clinicians to focus on the entire pathway and not only on the clinical phases they are in charge of. Clinicians are asked to share responsibility ‘to the population they serve, to the patients they never see, as well as to the patients who have consulted or been referred’ [49, p. 200] as “public health professionals”.

74
This approach stops clinicians being responsible for a specific phase or ward, and instead makes them jointly responsible for the network of services, the outcomes and the resources linked to a specific pathway.

§ 4.3. Methods

In order to diffuse Integrated Care into DF care, three main strategies were adopted:

- Using the MeS-Lab PES to encourage clinicians to focus on geographic variation;
- Using quantitative and qualitative information at both the HA and patient levels to inform clinicians’ debate and to spread the Population Medicine perspective;
- Creating a stable community of professional practice in order to discuss data, identify best practices of Integrated Care and share improvement actions [31, 32].

The project started in 2012 and was carried out over a period of about two years.

Encouraging clinicians to focus on geographic variation

Firstly, the diabetes-related lower limb major amputation rate (DRMAR) was included in the MeS-Lab PES (see Supplementary File 1 for a definition of DRMAR\(^\text{18}\)).

The most important elements of the MeS-Lab PES were then applied to the DRMAR. In fact, MeS-Lab PES proved to be effective in facilitating the comprehensiveness of the performance information and in supporting improvement [33-35, 54]. These elements include:

- The use of five coloured assessment bands based on the benchmark results: red - poorest performers; orange - poor; yellow - average; green - good; and dark green - best. Benchmarking enables performance to be evaluated by assigning the five bands considering the overall average and the distribution of HA results;

- The inclusion of the DRMAR in the dartboard diagram representing the overall performance of each HA. The dartboard has five bands: when performance is excellent, the results are positioned from the central dark green zone for best

\(^{18}\) Available at http://dx.doi.org/10.5334/ijic.1991.s1.
performers towards the outer strips, with red representing the poorest performance (Supplementary File 2 includes an example of the dartboard19).

- The public disclosure of results on a website, http://www.performance.sssup.it/toscana which not only provides stakeholders with all the information available but also through benchmarking creates a “competition” between clinicians based on reputation.

- The setting of quantitative targets: the Regional Government sets a quantitative target for each HA for each indicator included in the MeS-Lab PES.

- A link between the target achievement and the 20% variable share of HA CEOs’ annual salaries.

Using quantitative and qualitative analyses to spread the Population Medicine approach

In order to spread the Population Medicine approach, we provided clinicians with specific analyses that mixed different issues (service utilization, outcomes, costs), different levels of analysis (HAs and individual patients), and different methods and sources (administrative data analyses and patient surveys).

In addition, population-based data was cross-checked based on Small Area Variation Analyses (SAVAs) and data were calculated at the delivering facility level.

By benchmarking the utilization rates of healthcare services (e.g. surgical intervention, diagnostic procedures or hospital admission rates), the SAVA compared the costs and the outcomes, between geographic areas and comparable populations [55]. The delivery-perspective provided information regarding which facilities delivered specific services (e.g. performed surgical interventions) or directly generated costs.

Cross-checking these analyses provided a preliminary mapping of the real patient pathways, which usually involved several clinicians, wards and facilities in different HAs. This process challenged the inward-looking perspective and the silo-working approach of clinicians who focused only on patients seen in their own facilities or on the specific phase they managed. Regular benchmarking was essential in guiding data interpretation and discussions between clinicians regarding the potential lack of Integrated Care.

19 Available at http://dx.doi.org/10.5334/ijic.1991.s1.
All the analyses on service utilization, outcomes and costs were provided not only for each HA but also at a patient level.

The first level provided data on volumes and estimated expenditure for the services delivered by each HA for the various LHA populations. These analyses checked which services were globally delivered and the overall impact on LHA budgets.

Patient pathways were tracked across different services and facilities in order to help clinicians understand whether appropriate care was being delivered to each patient. These analyses focused on a cohort of 190 diabetic residents in Tuscany who had been amputated in 2011. The database was created with a record linkage of administrative flows between 2009 and 2012 regarding hospitalizations, outpatient visits, diagnostic tests, and drug consumption. Each patient’s clinical history considered the one year prior to and after hospitalization for major amputation.

Finally, the analyses discussed by clinicians was based mainly on administrative data, but also on a patient survey of specific phases of DF care.

**Engaging professionals**

From the very beginning, the program involved the DF clinicians in discussing the analyses, identifying barriers to integration and best practices and proposing improvements. The process of engaging clinicians was based on the principles of action research [31, 32, 56-58] and involved mapping the organization of DF pathways in each HA and organizing meetings to discuss data and practices.

Firstly, the two MeS-Lab researchers involved in the action research project and a representative of the Regional Commission for Diabetes designed a questionnaire to uniformly map the DF pathways (the Regional Commission for Diabetes is a technical consulting body for the Regional Administration made up of clinicians and technicians working in the regional healthcare system specialized in diabetes care). The questionnaires analysed eight areas where integration was considered essential: screening, admissions and visits, revascularization procedures, surgery, urgent pathways, follow-up and continuity of care, education for patients and caregivers, training clinicians, and information systems.
Researchers then visited the Diabetic Foot Outpatient Clinics in the 12 LHAs and in the three THs and mapped the organization of the DF pathways through the questionnaires in collaboration with the team leaders of the units. These clinicians were involved because of their role in coordinating the services and professionals involved in DF care. In addition, visits were planned so as to create a trusting relationship between the researchers and clinicians, in order to openly discuss their practices.

Researchers then arranged the first plenary meeting with clinicians and their DF-teams (e.g. diabetologists, nurses, podiatrists), the managers of the Health Departments of each HA, the representatives of the Regional Government, GPs and the Tuscany Diabetic Patient Association, with a total of 47 people.

The plenary meetings between researchers, managers and clinicians were then conducted around every three months to discuss the analyses and the results of the mapping, to identify good performance and Integrated Care best practices as well as to propose improvement strategies. Clinicians often suggested the calculation criteria of the quantitative analyses [31, 32].

§ 4.4. Results

The combined implementation of these strategies enabled those working on the project to foster Integrated Care in their local context. The project:

i) Shifted the focus to the reduction of geographic variations by using the MeS-Lab PES;

ii) Made clinicians more accountable for the outcomes of their local populations and enabled them to foster collaboration with other professionals in their local communities as required by the Population Medicine approach;

iii) Enabled clinicians to identify the gaps in integration and the organizational best practices and improve Integrated Care by tackling weaknesses.

In this section, the results are presented considering the main output of the three strategies. In addition, the specific case study of the Teaching Hospital in Pisa is described i.e. the Health Authority that faced major problems in terms of Integrated Care.
Focusing on geographic variation

The first step was to shift the clinicians’ focus on the variation in the DF care, by combining all the PES elements considering the most DF outcome: the DRMAR. The indicator was highlighted in a geographical map with coloured bands based on benchmarking (Figure 2). Data were also published on the Tuscany PES website.

Figure 2: Diabetes-related lower limb major amputation rate per million residents - MeS-Lab Tuscany PES results - 2012. Source: MeS-Lab

In addition, the Regional Government set a specific quantitative target for each LHA and requested that the poorer performers should strive to reach the same levels as the best performers (Figure 3).

Figure 3: LHA DRMAR targets in Tuscany for 2014. Source: MeS-Lab
Spreading the Population Medicine Approach

Age and gender risk-adjustments were added to the DRMAR, showing the persistence of variations even after controlling for the main population needs (Figure 4) and highlighting how each provider contributed to the overall rate.

Crosschecking the population and delivery levels showed the clinicians of the Teaching Hospital of Pisa how the amputations delivered in their facilities were contributing to the poor performance of the LHA in their geographical area (Pisa-LHA). In fact, in 2012, the risk of being amputated in the area of Pisa-LHA was fivefold higher than the risk in the Arezzo-LHA. Thus, the THs and the LHAs of Pisa, Firenze and Siena were assigned a common quantitative target to reduce the DRMAR in their contexts in order to share the joint responsibility of their populations.

Figure 4: Age and gender standardized diabetes-related lower limb major amputation rate per million residents in Tuscany, 2012. Details for the delivering Health Authority. Source MeS-Lab

For the 190 amputated patients included in the DF cohort, the researchers and clinicians examined whether or not each patient had received expected and appropriate care: two patients amputated in 2011 did not receive any outpatient visits and were not hospitalized within a year prior to their amputation. These cases showed that there were problems with Primary Care and Diabetic Foot Outpatient Clinics in fostering prevention, early diagnoses and early treatments. The audit process for these 190 patients showed how enhancing Integrated Care among
providers was necessary, notwithstanding the overall good results of Tuscany compared to other regions in Italy.

To highlight the lack of coordination with Primary Care, the MeS-Lab provided clinicians with a survey to assess the perceived quality of the Tuscan Program in the Chronic Care Model [59, 60]. Patients declared that the foot check-ups during Primary Care visits were the weakest point provided by GPs and their staff. In fact, foot check-ups showed an overall lower compliance with respect to other diabetes check-ups (weight, glycaemia, etc.) and they were also not performed uniformly (Figure 5) (See the Supplementary File 3 for the complete survey method\(^\text{20}\)).

![Figure 5: Diabetic patient experience regarding foot check-ups in Tuscan LHAs - Survey 2012. Source: MeS-Lab.](image)

The population-based perspective used for the cost-analyses enabled clinicians to discuss how the services provided in the DF pathways impacted on LHA resources. The audits on resources for DF pathways were carried out by dividing the overall healthcare expenditure for the 190 patients in the cohort (approximately € 6 million) into several components (e.g. hospitalizations, outpatient visits, diagnostic and laboratory tests, and drugs delivered within one year before and one year after major amputations).

\(^\text{20}\) Available at [http://dx.doi.org/10.5334/ijic.1991.s1](http://dx.doi.org/10.5334/ijic.1991.s1).
The researchers calculated the estimated LHA expenditure (based on DRG-tariffs) of hospitalizations for diabetes-related revascularization of lower limbs by considering the average expenditure between 2009 and 2012. The expenditure estimate for DRMAs was collected with the same criteria. In order to compare the impact of these two items on LHA budgets, the estimated expenditure was then re-proportioned per 100,000 residents (Figure 6) (see table in Supplementary File 421).

Figure 6: Estimated LHA expenditure (DRG) of hospitalizations for diabetes-related revascularizations and lower limb major amputations per 100,000 residents - Average of the four-year period between 2009 and 2012. Source: MeS-Lab

Thus, DRMAR hospitalization expenditure could be considered as an opportunity cost for delivering other services for preventing major surgical interventions (e.g. revascularizations). Figure 6 highlights that LHA expenditures varied sharply considering the overall values and the potential reallocation from expenditure for amputations to expenditure for preventive treatments. The best performer (the Arezzo-LHA) showed a strongly oriented mix towards revascularizations and did not account for the lower overall costs. The clinicians thus did discuss a more relevant topic for their daily practice, rather than the “traditional” issue of pure savings: the potential reallocation towards services with greater value for money, which can be achieved by enhancing coordination.

21 Available at http://dx.doi.org/10.5334/ijic.1991.s1.
between providers and shifting from a provider-centred to a population-based and patient-centred perspective.

The population-based approach helped the clinicians to shift their focus from the costs of the productive factors they directly managed in their wards (personnel costs, etc.) to the impact of the overall expenditure for DF patients on their own LHA overall budgets. The new accountability also included THs because of their role in delivering DF care for the residents in their LHA.

**Engaging professionals: shared solutions for implementing Integrated Care**

During the mapping phase and the periodic meetings, the community of practice outlined the barriers to Integrated Care in each local context and identified the best organizational practices.

Table 1 summarizes the mapping results divided into eight areas in the questionnaire. The results highlighted what issues were hindering Integrated Care practice and where.

The LHA of Arezzo, which was the national and regional best performer in terms of outcomes, was identified as the organization combining the best organizational practices.

The Arezzo DF-team identified clear steps for DF services in collaboration with the clinicians in other wards and settings. For instance, daily contacts between diabetologists and other clinicians led to the scheduling of weekly slots for diagnostic tests and revascularizations based on the analysis of demand. They also ensured fast-track pathways for urgent cases. In addition, communication was enhanced between wards: all the clinicians were fully aware of the DF issue and promptly informed the DF-team in case of inpatient DF complications, thus reducing both bottlenecks and late diagnoses/treatments. The cardiology department provided equipment for the DF-team in their ward so that the DF-team could directly care for hospitalized DF patients, regardless of organizational boundaries. In addition, the DFOC information system was completely integrated with the other systems implemented in other wards.
<table>
<thead>
<tr>
<th>Area</th>
<th>Mapping results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening, admissions and visits</td>
<td>Professionals pointed out coordination problems with Primary Care (PC) regarding the prompt identification and management of ulcers/complications, leading to late diagnoses. Patients were therefore often admitted to the outpatient clinics with severe conditions and without previous DF assessment by their GPs. This was confirmed by the survey presented in Figure N.5.: foot check-ups by PC professionals were not a common practice. Outpatient clinics also differed in the scheduling procedures for visits and diagnostics exams. Moreover, some HAs did not schedule dedicated slots in their radiology departments in agreement with the diabetology departments.</td>
</tr>
<tr>
<td>Revascularization procedures</td>
<td>The organization of this phase greatly differed between HAs. Some LHAs did not have catheterization labs to perform lower-limb revascularization procedures so they had to refer their patients to other HAs. This implied a greater need for coordination among these providers. Other HAs provided some schedule hours during the week for the revascularization of lower limbs. In some HAs, revascularizations were usually performed without involving the diabetologists.</td>
</tr>
<tr>
<td>Surgery</td>
<td>In some HAs, interventions and follow-up treatments were often planned without involving the diabetologists. Lack of coordination occurred both before and after surgery. Only in some HAs, diabetologists directly performed basic and minor surgical procedures.</td>
</tr>
<tr>
<td>Urgent path</td>
<td>Some professionals identified barriers to flexible and “fast track”, access, exams, revascularization procedures and interventions for patients with urgent needs because of a lack of coordination with other professionals.</td>
</tr>
<tr>
<td>Follow-up and continuity of care</td>
<td>Communication with PC professionals was also considered a critical aspect after discharges with regards to the management of lesions, wounds, ulcers and specific medications.</td>
</tr>
<tr>
<td>Education for patients and caregivers</td>
<td>Only in some organizations, educations for the prevention and treatment of ulcers and lesions was provided for both individuals and groups of patients and caregivers. PC professionals were often not well-trained in preventing and recognizing DF problems and providing appropriate education for patients and caregivers.</td>
</tr>
<tr>
<td>Training professionals</td>
<td>Periodic educational meeting on prevention, treatment and team building, especially between diabetologists and PC professionals, were not held in every organization. These meetings should be held more in large hospitals (such as THs) and in those areas where the care path is fragmented among LHAs and THs.</td>
</tr>
<tr>
<td>Information Systems</td>
<td>The development and implementation of information systems are very different in each organization. Only some HAs quickly collected comprehensive information about their patients over time and easily shared them with other departments.</td>
</tr>
</tbody>
</table>

Table 1: Summary of the organizational mapping.
Finally, the DFOC clinical staff performed minor surgical procedures thus avoiding the need for surgeons for basic treatments, and therefore reducing bottlenecks. Integration with healthcare services outside Arezzo’s hospital was also established: GPs had clear pathways for both DFOC activities and diagnostic exams through simple slot scheduling schemes. In addition, the DF-team participated in all the training initiatives organized at the Primary Care level in order to enhance awareness of DF complications.

After summarizing the issues that arose from the mapping phase and taking into account the case of Arezzo, the clinicians and researchers identified three main sources of barriers to Integrated Care, linked to the categories identified in the background section in terms of integration between:

1) units within the same organization: the main barrier was a lack of coordination among clinicians within an organization (e.g. a hospital). General surgeons, orthopaedics, cardiologists, vascular surgeons, interventional radiologists did not always coordinate with the DF-team (diabetologists, podiatrists). Instead, the DF-team should be quickly identifiable and involved in the decisions concerning the pathway regardless of organizational boundaries.

2) different care settings: the main barrier was the lack of coordination between hospital, community and primary care. Clinicians experienced a lack of information flow between care settings, such as between outpatient clinics and general practitioners. This also included a lack of mutual training between clinicians on essential topics for DF care and prevention.

3) different institutions: the main barrier was the lack of coordination between HAs. HAs in the same geographical area or in neighboring areas experienced stronger barriers to Integrated Care because of their “artificial” organizational boundaries. This occurred especially when a TH was the hospital care provider for another authority, the LHA, the other healthcare services (e.g. primary and community care).

The engagement approach used to support the mapping and the discussions was needed to compare practices and data. In fact, HA representatives participated in every meeting and frequently asked for additional in-depth analyses of their local contexts. The results of this engagement process enabled them to share organizational best practices and clinicians were encouraged to propose solutions
for the issues identified. This occurred both at the regional level, through the shared proposal for redesigning DF care organization, and at the local level, where each DF-team proposed initiatives to tackle the issues in their own context. In particular, the case of Pisa TH is an example of how the project changed the attitude of clinicians towards Integrated Care.

Finally, the engagement process succeeded in convincing clinicians to apply the same approach on other diabetes-related pathways (hypoglycaemia events, etc).

The diffusion of Integrated DF Care at the regional level

A proposal to re-design the DF pathway in Tuscany towards greater Integrated Care was sent to the Regional Commission for Diabetes. The document was based on the results of the project and provided organizational recommendations for tackling the three barriers. The document was approved by the Regional Health Council in July 2013, aimed at updating the future the Regional Administration Act 1304 dated 9/12/2003 on the organization of the DF care. The document focused on the following items, and was particularly inspired by the results achieved in Arezzo:

i) role of the diabetologists as the coordinator of the entire care with a pathway-oriented approach, regardless of organizational boundaries;

ii) implementation of flexible and shared fast-track pathways for urgent treatments and diagnostic tests;

iii) interdisciplinary collaboration of clinicians involved in the pathway at the hospital level (radiologists, podiatrists, diabetologists, vascular and orthopaedic surgeons, cardiologists, etc.);

iv) training for diabetologists in basic surgical skills;

v) clear and periodic communication, coordination and training initiatives between hospitals and primary care professionals in order to improve both preventive and follow-up care;

vi) reinforcement of the network of professionals in the different HAs, not just between the diabetologists but also between GPs, nurses and podiatrists.
The case of the Teaching Hospital in Pisa

Pisa-LHA is one of 12 Tuscan Local Health Authorities serving a population of about 340,000 residents. Hospital care in the city of Pisa is delivered by the Pisa Teaching Hospital (Pisa-TH) and not directly by the LHA, thus leading to complex coordination between hospital, community and primary care services.

The results of the Pisa-LHA DRMAR were expected to be good, considering that Pisa-TH was the regional referral centre for diabetes and it was the only hospital in the Region of Tuscany with a specific department managed by diabetologists. Conversely, during the three-year period 2010-2012, Pisa-LHA had one of the highest regional values.

The analyses carried out during the project identified the Pisa area as experiencing all three barriers to Integrated Care:

- integration between units within the organization: there were problems in internal coordination due to the high number of clinicians and wards involved in caring for DF patients;
- integration between care settings and institutions: there was a lack of coordination between care settings and Health Authorities. These Pisa-TH coordination issues were amplified because of the organizational boundaries with the Local Health Authority. Indeed, the division between the independent Pisa-TH in charge of hospital care, the Pisa-LHA in charge of community and home services, and the self-employed General Practitioners rewarded on a capitation-basis sharply increased lack of coordination. All the analyses carried out during the project confirmed these problems.

For instance, the Pisa area:

- accounted for the lowest adherence to the screening for foot complications in Primary Care, as previously shown in Figure 5;
- had the greatest need for reallocating resources from amputations towards preventative care, as shown in Figure 6;
- accounted for the highest DRMAR in Tuscany due to the high number of amputations affecting the residents in Pisa-LHA and delivered by the Pisa-TH.

Initially, the role of the Pisa-TH as DF regional referral centre was seen as a reason for not questioning the Pisa-TH about the persistently and increasingly high DRMAR of the Pisa-LHA. However, the project was effective in shifting the focus
from a delivery- to a population-based perspective. Indeed, the DFOC of the Pisa-TH started to re-consider its role as the most important delivering facility for the inhabitants of Pisa and therefore accountable for the results of the Pisa-LHA, regardless of the organizational boundaries between the authorities.

Thus, the DFOC-team began a constructive improvement process to deal with the three areas lacking integration.

Firstly, concerning integration between units within the organization, various improvements were carried out in order to foster structured relations with the other clinicians involved in the DF care in the Pisa-TH. MeS-Lab researchers provided more detailed information on the pathways of Pisa-LHA residents amputated in the Pisa-TH (length of stay, operation ward, discharge ward, age, gender, educational level, previous screening and revascularization, etc). The DF-team then carried out a comprehensive analysis of the DF care provided in the Pisa-TH. Before the project, the focus of the DFOC clinicians was only on the amputations they had performed or on those performed by other Pisa-TH clinicians for patients previously cared for in the DFOC. Hence, the patient pathways for amputations in the Pisa-TH without DFOC involvement (48%) were not analysed and discussed. Moreover, this lack of involvement of the diabetologists resulted in a less conservative surgical approach being provided in the other departments (in case of unavoidable amputations due to the severe health status of the patients, it is preferable to provide a conservative surgical approach, e.g. below the ankle, because it enables patients to walk using special shoes).

The mapping phase showed that the PISA-TH pathway for DF patients cared for by the DFOC was well staffed and organized. The DFOC included a team of podiatrists with resources and beds directly managed by the Diabetology Department. In addition, the DF-team performed minor and conservative amputations directly, with scheduled slots in the surgical rooms and in the cath-lab for revascularizations.

However, in the complex organization of the Pisa-TH, some patients left or did not start this path. The lack of shared decisions and a defined pathway was because in the Pisa-TH there were several practitioners in both clinician-led and academic-led wards, thus multiplying the interactions between professionals and departments and increasing the chances of poor coordination and miscommunication. This confirmed the need for greater integration among the several Pisa-TH clinicians and services, and it raised concerns about equitable treatment for DF patients.
Consequently, with the detailed analyses of patient pathways, the DF-team carried out internal audits with the other clinicians involved in DF care to map the internal pathway of each amputated patient; in particular, those who had not been previously cared for by the DF-team and had been hospitalized for amputations by the emergency department.

The results were presented to the vascular surgeons and a multi-disciplinary audit was then carried out to share whether and when to perform surgical procedures. These results were also discussed by the DF community of practice in the plenary meetings.

With regard to the integration between care settings, the key focus was to reduce the lack of coordination with Primary Care. The DFOC director decided to organize training courses for Pisa-LHA community nurses in charge of the DF screening phase. The initiative to overcome the TH boundaries and to interact with Primary Care structures of the Pisa-LHA area (in some cases, over one-hour distance by car from Pisa-TH) confirmed the strong commitment to the Population Medicine approach.

With regard to the integration between institutions, Pisa-TH fostered the overall coordination with the PisaLHA. The internal audits carried out by Pisa-TH clinicians were also adopted externally in order to map all the patient pathways that were shared by both institutions (i.e. the Pisa-TH and the other peripheral hospitals managed by the LHA). Periodical meetings involving health clinicians and managers of the two institutions were thus organized.

All these steps enhanced stronger collaboration and joint accountability by the Pisa-LHA and the Pisa-TH for the DRMAR results, thus overcoming organizational boundaries.

Finally, initial evidence of outcome improvements was found in the DRMAR indicator: after the start of the project, the persistent increase in the Pisa-LHA DRMAR stopped and in 2014 the Pisa-LHA DRMAR registered an overall decrease of 38% with respect to 2012.
§ 4.5. Discussion

Based on the study presented in this paper, some complementary steps should be carried out to tackle the barriers to integration and to drive consistent improvement in those pathways where Integrated Care is particularly related to outcomes [61].

This approach includes: the use of a transparent and systematic PES along with stimuli for driving focus on geographic variation; the diffusion of a Population Medicine approach to shift professionals from a silo-working to Integrated Care practice; and the engagement of professionals as the key to promoting concrete improvement.

The implementation of a Performance Evaluation System comparing benchmarking data and the use of effective tools to represent performance (dartboard and geographic maps) are the first steps in order to be able to highlight geographic variations and best practices. Public disclosure of these data raises professionals' awareness, leading to a “reputational competition” [25, 30, 62, 63].

However, the public comparison of results and “naming and shaming” are not enough to ensure change [25, 30]. In fact, to spread Integrated Care and to improve outcomes professionals need to increase their awareness of any lack of integration within the system. Measuring and evaluating should thus be complemented with in-depth analyses to audit practices. This should be carried out through quantitative analyses based on administrative data regarding patient pathways and through “narrative” tools based on real patient stories. This evidence should inform audits in order to recognize and investigate sentinel events [64] when Integrated Care fails in daily practice. These analyses should thus go beyond the single provider level and should cross-check the delivery- with the population-based perspective.

In addition, discussing analyses with clinicians comparing service utilization and outcomes with costs shows that, in most cases, it is possible to achieve greater quality of care and better outcomes without increasing costs. Indeed, financial sustainability can be achieved through resource reallocation rather than through across-the-board budget cuts. As in the case of the DF, fostering this issue in those multi-provider and multidisciplinary pathways where Integrated Care is strongly connected with quality of care, can foster value for money strategies and should become a financial priority.
To implement improvement actions towards Integrated Care, an engagement strategy [65, 66] should be pursued. Based on our experience, this can be done firstly by mapping organizational practices in each Health Authority and, secondly, by involving all the professionals in periodic peer-review meetings. Mapping takes into account the specificity of each local context and thus enables professionals to outline their own experience and environment. This is the first step for professionals to be engaged in a permanent community of practice. In this environment, clinicians can systematically discuss data and experience and receive constructive feedback through peer-pressure [67].

This approach actually enabled professionals to outline best practical models of Integrated Care and share improvement solutions. Hence, the community of practice allowed also to identify and reward the best performers through peer-reputation.

Finally, the community of practices needs to share a common set of values that enables professionals to feel jointly accountable for the entire pathway and not only for the phase they are in charge of. In this respect, the Population Medicine approach embodies this key message and could be identified as the set of work values that should shape the professional culture in those organizations seeking more Integrated Care.

The approach presented in this paper was framed specifically in Tuscany, and in a specific highly-specialized pathway, the DF care. However, our approach could be applied to all areas and to all care pathways where Integrated Care may be the leading factor to improve outcomes.

In fact, for all those health services whose results are strongly linked to Integrated Care, a new specific category regarding the determinants of geographic variation could be identified. Wennberg and colleagues [17-19], in studying the determinants of geographic variation, suggested three main categories: effective care, supply-sensitive care, and preference-sensitive care [17-24, 68]. In the first category, the authors consider individual procedures where clinical evidence is available and variation should be reduced.

Based on our experience, “effective care” should be split into two subcategories (Table 2).

In fact, some care paths cannot be evaluated individually by considering the individual procedures and treatments but need to be considered with a pathway
perspective, where Integrated Care is the significant factor that affects outcomes along the entire care continuum.

Therefore, as in the case presented in this paper, it is possible to recognize services whose geographic variation is related to a lack of Integrated Care. For these services, Integrated Care and unwarranted geographic variation are connected and a comprehensive strategy to reduce equity gaps by diffusing integration should be carried out.

<table>
<thead>
<tr>
<th>Categories of variation in medical care</th>
<th>Actions</th>
</tr>
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<tbody>
<tr>
<td>Effective Care of an individual service or procedure (e.g. minimal volumes for specific surgical procedures to ensure patients' safety and better outcomes)</td>
<td>Refers to services of proven values and without significant trade-offs: the benefits of these services outweigh the risks</td>
</tr>
<tr>
<td>Effective care of an Integrated Care pathway</td>
<td>Refers to services whose variation is due to a lack of integration through the entire care pathway</td>
</tr>
<tr>
<td>Supply-sensitive care</td>
<td>Represents service for which human and the availability of technical resources (e.g. physicians, hospital beds) strongly influence the amount of care delivered</td>
</tr>
<tr>
<td>Preference-sensitive care</td>
<td>Comprises care for conditions that have more than one treatment option, each with its own benefits and trade-offs</td>
</tr>
</tbody>
</table>

Table 2: The determinants of geographic variation [adapted from 17-24, 68]

§ 4.6. Conclusions

In a Beveridge Healthcare System, which pursues universal coverage and equity, clinicians should be engaged in a cultural change where their work is less constrained by organizational boundaries. Clinicians should be steered towards the
creation of overall value for patients in a population-based perspective and the adoption of Integrated Care as a systemic approach throughout the entire pathway.

Services whose outcomes are particularly related to Integrated Care should be fully analysed by a stable community of practitioners in order to identify and tackle barriers to integration. This will create a healthcare system where clinicians share joint accountability for both the outcomes and the costs of the care pathways in which they are involved and not just for the patients they directly care for, the phases for which they are in charge of, or the productive factors they manage. This process enables healthcare professionals and managers to share their common commitment towards the principle of equity pursed by Beveridge healthcare systems.

**Acronyms**
DF: Diabetic Foot
PES: Performance Evaluation System
MeS-Lab: Management and Health Laboratory
LHA: Local Health Authority
HA: Health Authority
DRMAR: Diabetes-related lower limb major Amputation rate
DRG: Diagnostic-Related Group
DFOC: Diabetic Foot Outpatient Clinic
TH: Teaching Hospitals
CCM: Chronic Care Model PC: Primary Care
Supplementary Files
§ 4.7. References


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CHAPTER 5 - Conclusions

University hospitals play a strategic role in shaping the future effectiveness and sustainability of the entire healthcare systems. Indeed, considering the evolving role of hospitals in the healthcare delivery and the increasing demand for multi-provider care paths, future generations of clinicians should be trained with a pathway and system perspective, overcoming the traditional boundaries between providers.

University hospitals double the nature of *professional bureaucracy*, with multiple income streams, a high and multifaceted degree of decentralization and autonomy of professionals with diverse objectives and priorities.

In this context, managerial practice and policy-making would particularly benefit from the essential support of performance evaluation that shifts the focus from a hospital-centred to a system perspective.

This Thesis and the three papers presented provide insights on how performance evaluation can evolve in accordance with the changing hospital role in order to foster the redesign of the healthcare delivery system and the medical education, highlighting the relevance of some enabling factors, such as the public disclosure of data, the engagement of professionals, and a broader perspective in analysing hospital performance.

In the challenging healthcare scenario, this process is essential to guide the complex reorganization of healthcare system delivery towards a more sustainable, effective and equitable healthcare system.
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