From performance measurement to performance management: engaging physicians in decision-making processes and quality improvement strategies

A thesis presented
by
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to
The Class of Social Sciences

for the degree of
Doctor of Philosophy
in the subject of

International PhD in Management: Innovation, Sustainability and Healthcare

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Scuola Superiore Sant’Anna
A.Y. 2014-2015
To Luca
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CHAPTER 1 Introduction

This doctoral research is a compilation of three papers discussing the strategies and levers to engage physician in decision-making processes and quality improvement strategies at regional and local level in the Italian context.

There is not a well-developed body of knowledge about physician engagement in Italy and, even if literature from other jurisdictions provide valuable insights, it is worthwhile to consider the characteristics of the Italian health care system. In particular, more attention to regional and local contexts is required, because the Italian regional healthcare systems are based on different logics and perspectives influencing the organization and provision of services. In this thesis, the context of analysis is the Tuscan healthcare system.

In Chapter 1 a broader view of the literature about the physician engagement is provided, seeking to develop a framework for understanding the main strategies and levers to be implemented and their adaptability to the Italian public healthcare system. In particular, the framework of Max Weber’s typology of social actions (1991) adapted by Lee and Cosgrove (2014) is analyzed and revised to provide insights for application in the Italian context. Adapted for healthcare professionals the four motivations that drive social actions are: shared purpose, self-interest, respect and tradition.

The three papers of the thesis, illustrated in the following chapters, are preceded by a short summary clarifying the strategies and levers used, according to the revised framework.

In Chapter 2, the first paper (“Priority setting in healthcare: comparison of socio-technical approaches”) presents the implementation of a physician engagement strategy in the context of priority settings policies. It compares the techniques and the decisional processes applied (phases, actors involved, and length) by two socio-technical approaches for the definition of priorities of action: the Programme Budgeting Marginal Analysis (PBMA) and the Socio-Technical Allocation of Resources (STAR). These approaches are presented providing examples of application in national and international contexts (Canada, UK and Tuscany). The paper offers useful insights for the Italian healthcare system to improve the resource allocation process at local level and to share and spread improvement initiatives through an enhanced collaboration among decision makers, managers and professionals.
In Chapter 3, two papers are presented about the engagement of professionals in quality improvement initiatives at regional level through the implementation of a peer-review approach among physician with the support of researchers. The second paper of the thesis (“Measuring the relationship between outcomes and DRG tariffs in the treatment of Acute Myocardial Infarction: the case of Tuscan hospitals”) is part of a broader project involving Tuscan cardiologists to deliver a report on evaluation and management of geographic variation in the care of cardiovascular diseases. The paper focuses on exploring potential differences in the Acute Myocardial Infarction (AMI) outcomes and DRG-based expenditures among Tuscan hospitals, by using administrative healthcare data. In particular, it aims to focus physicians attention on the differences in the treatments provided to AMI patients, in order to understand whether there is an association between outcomes (30 days mortality) and costs (estimated as DRG-based expenditures at 30 days after the index admissions). The paper contributes to the debate among cardiologists to understand the impact of their therapeutic and treatment choices on system expenditures and the use of administrative data to identify and share best practices.

The third paper of the thesis (“Overuse or value for patients? Changing clinicians’ approach in the diabetic foot care pathway”) presents a project aimed at identifying and spreading organizational best practices in the Diabetic Foot Care in Tuscany, by sharing improvement strategies and shifting clinicians’ approach towards integrated care. A peer-review process based on the benchmarking of practices, processes and outcomes was carried out and the professionals were involved in the mapping of the care path organization and in the analysis of patients’ stories, overcoming organizational boundaries. The project led to share improvement strategies at both regional and local levels.

Chapter 4 discusses the findings of the papers with the lens of the strategies and levers described and adopted at international level to promote physician engagement, considering in particular the framework described in Chapter 1. Final considerations about the strategies and levers to be adopted in the Italian context, and particularly the Tuscany region, are provided.
1. Background

In response to demands for improved performance, accountability and cost containment, there is growing international interest for a greater engagement and alignment of healthcare professionals with system and organizations goals and values. In particular, the physicians need to cope with system challenges, since, as it is demonstrated in many studies and practices, their lack of engagement leads to the failure of any ambitious strategy of change (Kassi, 2012; Lee and Cosgrove, 2014). As highlighted by Mintzberg (2012), one of the myth of health care is that problems can be fixed by “experts”, such as economists, system analysts and consultants, and not people on the ground, such as physicians and the other healthcare professionals. On the contrary, securing physician engagement at all levels is critical for health system reform and organizational performance (Clark, 2012; Reinertsen et al., 2007; Doctors of BC Policy, 2014), because there is a strong positive link between an organization’s clinical and financial performance and the degree to which physicians are engaged in maintaining and enhancing its performance (Spurgeon et al., 2011; Ham and Dickinson, 2008; Ham, 2009). Furthermore, the physician’s involvement in creating value for patients by containing costs and improving quality is crucial, since physicians are responsible for about the 75% of the costs incurred by healthcare organizations (Tjosvold and MacPherson, 1996).

This thesis focuses on physician’s engagement not because engagement of other professionals is unimportant (indeed, their involvement is equally critical to the success of healthcare), but because, as emphasized by Gosfield and Reinertsen (2003) “patients primarily experience the health care system through their one to one relationship with a physician…. Most aspects of health care are ultimately derivative of physician behavior”. Furthermore, very little happens in the healthcare system without physicians’ order (Reinertsen et al., 2007). Physicians are at the basis of the clinical service delivery and their performance is the primary determinant of the service value delivered to the patient (Schwartz et al., 2000).
This is due to the fact that healthcare organizations traditionally present a reverse hierarchy (or inverted pyramid) conceptual structure (Figure 1), in which key decisions are made by the employees (as physicians) in direct contact with patients, while senior management positions support and control their activities and try to orient their actions (Mosley, 2014). Indeed, within a traditionally structured organization, ideas and direction flow primarily from top to bottom, from executive to worker level. Organizations in the open-market competition are often structured in this way in order to have greater control over the performances and achieve higher profitability. At the same time, also in public organizations the traditional hierarchic model is often present: even if the strategic choices are made to answer the citizens’ needs, the strategies are then often implemented in the organizations with a top-down approach.

On the contrary, healthcare public organizations and other innovative organizations (for example in the IT services) present a reverse hierarchy structure since their activities and performances are based on the work of many highly specialized employees with great impact on every day decisions. For this reason, the focus is on the people who actually interact with the customer (or patients), adding value across the organization. At the same time, even if this kind of reverse hierarchy structure seems “natural” for the healthcare public organizations, it has to be managed in order to harness the full capacity of the highly specialized human resources working there, deal with the information asymmetries arising from the specialist nature of medical knowledge and provide higher value-for-money for citizens.

![Figure 1: Traditional and Reverse Hierarchy](image)

*Figure 1: Traditional and Reverse Hierarchy (figure adapted from Leeson, 2013 and Amerini et al., 2014)*
In this context of “professional bureaucracies” (Mintzberg, 1979), physicians are autonomous professionals with greater control over day-to-day decisions than staff in formal positions of authority such as managers. This type of decisions include the overall delivery of services and treatments, impacting, for example, the prevention of resource misuse, overuse and underuse. In this setting, physicians have traditionally maintained a model of individual professionalism and clinical autonomy, “where each practitioner works with his or her own patients in discrete areas of practice and where the defining influence on medical decision-making is based on assessing the needs of the patient” (Baker and Denis, 2011). For this reason, healthcare organizations used to apply a “double-hierarchy” decision-making models, dividing clinical and administrative/managerial authorities and responsibilities. Nowadays, in order to cope with the actual financial and demographic challenges, there is the need to implement shared decision—making approaches, in which both the managers become more aware of the characteristics of the clinical activities and the physicians gain knowledge about managerial techniques (Freidson, 2002). Recognizing the distributed and collective nature of effective leadership, some health care organizations are attempting to create greater alignment between clinical and managerial goals, focusing on improving quality of care (Baker and Denis, 2011). Therefore, once autonomous, physicians are now more and more forced to integrate with healthcare plans and other providers and to apply in their daily activities the concepts of teamwork, integration of care, multidisciplinarity and cost efficiency (Schwartz et al., 2000). The increased expectations regarding the roles that physicians can play in improving healthcare system can be summarized looking at the competences they are required to develop in their practice (see Figure 2). These competences concern:

- their clinical skills, which have to be always updated due to the increasing complexity of diseases, patients conditions and technological advances;
- their relational competences, both with patients and caregivers and with colleagues and other healthcare professionals;
- their managerial and leadership competences, to interact with all the system’s stakeholders and cope with systems needs and constraints, by leading the required change.

1 “Misuse occurs when an effective treatment or procedure was selected but was then performed poorly so the patient failed to receive its full potential benefit. Overuse refers to the provision of a health service when its risks exceed its benefits...underuse is the failure to provide a health service in circumstances where it would have provided a net benefit.” (Dunham et al., 1994)
The complexity of the skills and competences make the physicians more and more under-pressured, stressed and frustrated. Indeed, physicians, whilst they are actually struggling to care for their patients, constantly hear that they have to improve and work harder to achieve more and more challenging targets, without, most of the time, have the possibilities to discuss and participate to the decisions processes in the organization (Lee and Cosgrove, 2014). Organizations where physicians are not asked for their opinion, or are asked for their input after a decision has already been made, discourage engagement (Grimes and Swettenham, 2012; Doctor of BC Policy, 2013) and increase physicians frustration and resistance to change. In this vicious cycle, the negative attitude of physicians prevents managers to actually develop engagement strategies, since professional autonomy and physician focus on high-quality patient care is often perceived as conflicting with an approach focused on teamwork, population health and systems of care (Becher and Cassin, 2002). Indeed, the traditional view of physician – organization relationships is based on the tensions between professional practice and organizational pressures. But as physicians increasingly practice in organized settings (complex healthcare organizations, primary care groups, multidisciplinary teams, etc), they accommodate to this situation and recognize that their practices are embedded in a broader context (Baker et al, 2013). Actually, the physicians themselves are becoming aware that it is no longer possible
for them to respond to the current needs of patients and population without a change in their practices and behaviors. Therefore, the medical profession has been redefining the characteristics of a good doctor, including not only the reinforcement of the need to be clinical experts, but also good team-workers, managers and leaders (Clark, 2012), learning how to navigate in and continually improve complex systems, in order to improve the health of the patients and communities they serve (Berwick and Finkelstein, 2010). In this sense, there is a growth of physician involvement in leadership roles and formal decision-making or governance bodies, but this by itself cannot respond to the need of greater physician engagement (Denis et al., 2013). Indeed, Gosfield and Reinertsen (2010) point out that the key question about physician engagement is not “how to get physicians to engage with organizations and their projects”, rather is “how to get physicians to engage with each other in improving quality, safety, and value” in the organization and in the system. In this sense, the engagement is “a process of dialogue with individuals and groups that leads to sharing information, consultation and in some case active involvement in decision making” (Alberta Health Services, 2011). With this perspective, physician engagement cannot be limited to initiatives located at the apex of the organization or system. More effort is needed to build relationships, trust and good will overtime to make physicians contribute “to maintain and enhance the performance of the organization, which itself recognizes this commitment by supporting and encouraging high-quality care” (Spurgeon et al., 2011). However, even if the term “physician engagement” has become more common in the scientific and popular literature in the last decade, only recently, there have there been serious attempts to find ways to enhance it and spread it at all levels in the healthcare organizations (Kassi, 2012). Furthermore, with the actual economic and social contexts, physicians and organizations need to be accountable and responsible for the healthcare services provided to patients and population over time and for the resources spent on those services. In this sense, the engagement of physicians should be the first step in order to make them responsible and accountable for the value added services provided to improve population health and their costs for the society.

For this reason, there is a growing interest in the literature to find ways to engage and make physicians responsible in achieving organizational and system targets. In particular, more knowledge is required about the design and the implementation of strategies and levers to initiate and support physician engagement. Indeed, in general,
physicians tend to focus on the barriers to their engagement in quality improvement initiatives, giving a more limited list of enablers and levers (Johnston et al, 2010). Many organizations tried to achieve physicians’ engagement by “combining good intentions with few broad interventions, such as putting doctors in leadership roles and creating financial incentives for desired behavior” (Lee and Cosgrove, 2014). Nevertheless, all these methods and approaches applied and tested in many organizations might all be insufficient, if the efforts are not coordinated, integrated and consistent within an overall strategic framework (Lee and Cosgrove, 2014). Physician engagement does not happen on its own (Doctors of BC Policy, 2013) but need to be part of a broader system strategy for continuous improvement. Indeed, physician engagement can no longer be about short-term maximization of fee-for-service revenue (in the context of private healthcare organizations/systems) or about short-term “spending review” strategies (in the context of public organizations/systems), but it must pursue the improvement of the value-for-money for individual patients and the entire population.

2. The framework: tools that improve professionals engagement

A good framework summarizing the main levers to be used to engage physicians in the pursuit of organizational and system goals is the one by Lee and Cosgrove (2014) based on Max Weber’s typology of social actions (1991). Adapted for healthcare professionals the four motivations that drive social actions are: shared purpose, self-interest, respect and tradition (Table 1).
<table>
<thead>
<tr>
<th>Type of social action (Weber, 1991)</th>
<th>Motivation for physicians</th>
<th>How to apply it</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rational-purposeful Action: goal-oriented action in which goal and mean are rationally chosen.</td>
<td>To engage in a noble shared purpose</td>
<td>Appeal to the satisfaction of pursuing a common organizational goal.</td>
<td>- The Cleveland Clinic uses an array of communication tools to reinforce its commitment to compassionate care. In particular, through the spread of a single patient’s story, the clinic instituted a same-day appointment policy whereby all patients who call are asked whether they want to be seen immediately. - Advocate Health Care (Chicago) instituted mandatory morning huddles for physicians, nurses and leaders to discuss safety issues. After the introduction, disclosure about safety events and performances increased.</td>
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<tr>
<td>Value-rational Action: rational action for the achievement of goals defined in terms of subjective meaning.</td>
<td>To satisfy self-interest</td>
<td>Providing financial or other rewards for achieving targets.</td>
<td>- At Geisinger Health System (Pennsylvania), 20% of physicians’ potential compensation is tied to their performance against certain goals and how they do as a team. - On the contrary, Cleveland Clinic’s physicians are all salaried, without any performance bonus, but they undergo detailed annual performance review to renew their contracts.</td>
</tr>
<tr>
<td>Affective Action: action/reaction resulted from the emotional state of the actor in a given set of circumstances</td>
<td>To earn respect</td>
<td>Leverage peer pressure to encourage desired performance.</td>
<td>- Patients’ rating of University of Utah physicians are shared both internally and on public websites to drive improvements in patients’ experience. With each escalation in transparency, overall performance improved. - At Partners Healthcare System, unmasked data on individual physicians’ use of radiology test led to an immediate 10-15% drop of high cost tests, due to decreases among “outlier” physicians.</td>
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<tr>
<td>Traditional action: action guided by customs and long standing beliefs.</td>
<td>To embrace tradition</td>
<td>Create standards to align behaviors, and make adherence a requirement for community membership.</td>
<td>- At the Mayo clinic, doctors have to follow a strict dress code, since the clinic was founded in the late 19th century. Furthermore, the clinic has standards for how physicians communicate with one other and how they interact with patients (“Mayo way of doing things”).</td>
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Most health care organizations already use one or more of these levers, but, Lee and Cosgrove (2014) suggest that the most successful rely on all four. One example about the successful implementation of a physician engagement strategy based on all the four levers is the one launched by Ascension Health of St. Louis (US) in 2006 in order to improve outcomes for patients and reduce malpractice costs. This was achieved through the implementation of a “full disclosure” policy (before this initiative disclosure about unexpected events occurred only 10% of time). Firstly, Ascension shared evidences suggesting that full disclosure leads to better performances ("to engage in a noble shared purpose") and negotiate premium credits for malpractice insurers for physicians who agreed to full disclosure training in order to win their resistance ("to satisfy self-interest"). It also recruited respected local leaders to encourage acceptance ("to earn respect") and created a new operational standard introducing the "event response teams" to whom doctors were required to consult to address issues that might have been caused by errors ("to embrace tradition"). As a result, the disclosure rate rose to 24% in only three months and achieved the 56% after 27 months.

Another example of use of the four motivational levers is the one of the emergency department at Brigham and Women's Hospital (Boston, US) to improve dismal patient-experience ratings. The staff initially felt hopeless about its ability to improve patients' experience, because many emergency department patients have mental health issues and complex socio-economic challenges. Therefore, hospital leaders decided to focus physicians' attention in positive direction by sending to physicians only the positive comments of the survey, in a sort of “positive deviance” approach (Bradley, 2009). Then clinicians were asked to figure out how to make good patient experiences happen all the time ("VIP Care for All” was the share noble purpose in which the physicians have been engaged). Then changes in the layout of the emergency department and in the processes were adopted following lean management principles. Dashboards were developed to enable doctors to see how they performed compared with their colleagues on measures such as patients' length of stay and patient-experience (the importance of respect by peers was used as a lever). Standards were set governing how clinicians should work together, and leaders made it clear that adherence was not optional (setting standards create a tradition of aligned good behavior). Finally, financial incentives rewarded improvement for both individuals and teams (satisfying self-interest). Performances improved dramatically: patient
satisfaction rose from the 6th percentile to as high as the 99th percentile, remaining above the 90th percentile during most quarters since the effort began.

But are these levers adaptable also to the Italian context? Is Italian healthcare system facing the same challenges and can these levers help in engaging physicians to lead the required improvement? The Italian case of the Humanitas research Hospital (Milan) presented in the Italian version of the article by Lee and Cosgrove (2014) proves that the four levers proposed are suitable also for the Italian context. Indeed, also in Italy the challenging economic and demographic conditions required the engagement of physician to improve value for patients. Also in Italy, healthcare has been more “physician-centered” than “patient centered” and physicians have been focused mostly on their clinical activities, without being involved (and sometimes also without wanting to be involved) in the managerial and economic issues. Nowadays, physicians need to be accountable for the care they provide and have to be engaged in the organization improvement strategies. In particular, the Humanitas Institute used all the four levers described by Lee and Cosgrove, in the following way:

- Physicians were engaged in a “noble shared purpose”, by giving to physicians responsibility on the budget of their units and by involving them in strategic decisions (such as the acquisition of technologies, the design of paths of care, planning of research activities, etc.) with the support of the “Operations” organizational function. Furthermore, physicians’ suggestions were taken into account through a periodic opinion survey to collect best practices.

- Physicians performance is evaluated throughout a performance evaluation system with quantitative and qualitative goals. One of this goals regards the participation of physicians in “knowledge sharing” groups to improve their practices. This satisfies the “self-interest” of physicians to improve their clinical and managerial competences.

- Physicians are stimulated to discuss and benchmark performances not in a competitive way, but to enhance collaboration (“to earn respect”). Furthermore, physicians are also responsible of the career development of the members of their teams.

- Physicians working in Humanitas are selected with a lot of attention and trained to answer to Humanitas codes and values regarding high quality of care and excellence in research (“to embrace tradition”).

Both the US experiences and the Humanitas one are very interesting and provide useful insights about how to engage professionals in organizational goals. However, all these experiences consider the engagement of physicians only in one particular
private organization without broader strategies of collaboration with other providers. Furthermore, physicians are usually involved in small local quality initiatives such as clinical audits (Sewell, 1997). On the contrary, to address Italian healthcare challenges it is necessary to engage physicians in a public system perspective, enhancing collaboration, appropriateness, uniformity and equity of care. There is the need to change the focus from the single hospital or organization to the overall local and regional healthcare system. Indeed, the Italian National Health Care System, which follows the Beveridge model (Beveridge, 1942; Musgrove, 2000) and provides public universal coverage, should offer a uniform and equitable capacity of response for citizens considering both horizontal and vertical equity. Vertical equity can be pursued through specific projects and initiatives, whilst horizontal equity needs an integrated approach, combining different levers (Nuti et al, 2010). In this sense, the framework by Lee and Cosgrove (2014) provides useful insights to cope with horizontal equity and unwarranted variation issues (Appleby et al., 2011), but the individual levers have to be adapted to the characteristics of the Italian health care system. In particular, more attention to the regional and local features of the healthcare delivery is needed, because of the significant regionalization of the Italian National Health Services and the impact of the different policies on the organization and delivery of services at local level. In this context, the Tuscan healthcare system setting is very interesting, since Tuscany is a region with a high degree of managerial control over the delivery of health care and a consolidated performance evaluation system (Nuti et al., 2010). Indeed, publicly benchmark of performance data is the first step to identify gaps and unwarranted variation, even if measurement and evaluation alone are not always sufficient to drive improvement (Appleby et al., 2011). The system and the population perspectives should be always taken into account in all the levers and actions implemented to engage physicians into improvement strategies. Therefore, the levers described by Lee and Cosgrove (shared noble pursue, self-interest, respect and tradition) should be complemented and adapted in the following way:

- Shared Noble Pursue: physicians’ engagement must begin by focusing on shared purpose, without which the pursuit of the other three levers cannot be effective. To help physicians move beyond their resistance to change, the focus has to be shifted towards something positive, noble, and important: better care for patients. Improved

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2Horizontal equity is the allocation of equal or equivalent resources for equal needs, whilst vertical equity is the allocation of different resources for different levels of needs.
patient care has to form the core of any change agenda and organizational and system goals. Focus on patients and their suffering, by illustrating real data on individual patients’ story, trumps all other concerns and gains physicians’ attention. In particular, physicians are interested in deepen their clinical knowledge and have a better understanding of the determinants of outcomes, especially for important and widespread diseases (chronic diseases but also acute severe conditions). Performance data should be used to demonstrate how proposed changes can improve efficiency and patient outcomes. In particular, these data can help in smooth over the conflicts between efficiency, effectiveness and equity (Sassi et al, 2001). These trade-offs are common since policies that are designed to improve operational efficiency and effectiveness of outcomes (reduction of the number of beds in a hospital, the closure of departments with low volumes of interventions and of the little hospitals) often have the potential to increase health inequalities (patients living in disadvantaged areas far from the main hospitals/providers might encounter difficult access to care) or they may improve fairness while challenging efficiency. Furthermore, the use of vignettes about patients' struggles and triumphs get physicians thinking about what kind of care makes them ashamed or proud. At the same time, the need for sacrifice has to be frankly acknowledge: physicians might reduce autonomy and might have to learn new skills and competences. It has to be clear also that the sacrifices will not be only for the physicians: the managers should be open to change too, committed to work in collaboration with physicians and to learn from their experiences. Indeed, creating a shared purpose starts with the same steps used to build consensus in any organization: listening, demonstrating respect for diverse views, and creating processes to share improvement proposals. Physicians should not feel alone in the improvement process: they should feel that their contribution is essential to drive the required change but they need to be sustained and encourage by managers and by the system through clear commitment by both the organizational board and the regional government. Indeed, many of the improvements required need to be developed with a network perspective, involving different providers. Summarizing, a share purpose is focused on patients and on the acknowledgement that the status quo is inadequate and must change with a shared group action.

- **Self-interest:** physicians, like everybody, are motivated also by financial incentives and job security. Even if their organization’s noble shared purpose resonates deeply with them, they also care intensely about what measures are being used to gauge their
performance and how the data are collected and analyzed. In the Tuscan context, like in most Italian Regions, the amount of physicians’ remuneration dependent upon performance is little and there are normative boundaries to increase it or change it. However, if physicians believe that a particular management-endorsed behavior or practice will improve patient care, even minimal financial incentives will be enough to help them implement it consistently. If they are uncertain about whether it will actually improve care, even large incentives will produce only marginal success. Of course also intrinsic incentives have to be implemented. Professional reputation through public disclosure of results is an important mechanism to stimulate professionals’ self-interest (see the following lever: respect). Furthermore, the correct understanding of the performance measurement data and the possibility to help in the construction of more consistent indicators, able to represent patients’ conditions and orient clinical choices, is an incentive to work together and be engaged in the improvement initiative. Finally, training initiatives focus on the spread of best practices and opinion leaders’ interventions to share competences are an important levers for physicians.

- Respect: as already underlined in the previous lever, physicians appreciate positive feedback, and they particularly worry about losing the respect of their colleagues. In this sense, it is important to recognize the sensitivities associated with the public release of performance data and the related impact in improving performances. Systematic reviews on publicly reported performance data on quality of care have shown inconsistent results (Fung et al, 2008; Marshall et al, 2000; Flottorp et al, 2010), but some evidence suggests that public release of performance data stimulates quality-improvement activity at hospital level. Even if the effect of public disclosure of performance data has on performances remains uncertain, Berwick and colleagues (Berwick et al, 2003) propose two pathways by which reporting might improve performance: selection and change (Figure 3).
In the “selection pathway”, a consumer (patients or organizations “who can make choices among providers of care or otherwise act on their judgments”) obtains and compares performances to try to obtain the best value for his situation and acts for reward, recognition, punishment, payment, and other forms of decisions (Flottorp et al, 2010). Selection as a mechanism for improvement does not by itself change the basic distribution of performances (“it does not automatically cause any surgeons to become better at surgery”), but it is the basis for the implementation of a change pathway (Berwick et al, 2003). In this sense, the Tuscan Performance Evaluation System offers a great amount of data and rigorous indicators in benchmarking, which both provide information to patients and organizations and help in identifying possible rooms for improvement (Nuti et al, 2010). In the “change pathway”, indeed, performance results help organizations understand and change their care processes to improve their performance. The main difference with the “Selection pathway” is that the “Change pathway” rely nearly totally on the actions of people and organizations who actually provide care. As well exemplified by Berwick and colleagues “A grocery shopper can
select the best bananas without having the slightest idea about how bananas are grown or how to grow better bananas. Her job is to choose (selection pathway). Banana growers have quite a different job. If they want better bananas, they have to understand the processes of growing, harvesting, shipping, and so on, and they have to have a way to improve those processes. This is the change pathway”. The change pathway is usually combined with external incentives (“Self-interest” lever) rewarding highly performing providers or sanctioning poorly performing ones (Flottorp et al, 2010) and with other mechanisms related to peer pressure and professional reputation. Indeed, change may occur through pressure to avoid being identified as a poor-quality provider and/or poor-quality physician. Nevertheless, peer pressure should be used not only in a “naming and shaming” attitude (Bevan et al., 2013), but to enable the “change pathway” through the sharing of organizational best practices among physicians and organizations (Berwick et al, 2003). In this sense, there is the need to enable peer-review mechanisms and increase collaboration, making physicians work together and creating “communities of practice”(Wenger et al., 2002). Indeed, “communities of practices”, that can be created involving physicians, other professionals and managers on a particular topic/path of care at regional or local level, are defined as groups of “people [who] share their experiences and knowledge in free-flowing creative ways so as to foster new approaches to problem-solving and improvement, help drive strategy, transfer best practice, develop professional skills and help [organizations] recruit and retain staff” (Wenger et al., 2002). These people don’t necessary work together on a day-to-day basis, but they get together because they find value in their interactions, sharing information, insight, and advice. They also work to solve common issues and explore ideas and act as sounding boards to each other. Physician engagement and a successful establishment of community of practice usually do not happen on their own (Doctors of BC, 2014; Touati et al., 2012). Organizational culture, structures, communication processes and the role of a facilitator can encourage physician’s propensity to engage (Doctors of BC, 2014). Therefore, these communities have to be sustained by researchers in the role of facilitators able to orient the discussion and support the understanding of performance measurement data. In Tuscany, these “communities” have been established thanks to the collaboration of Mes-Lab researchers with the physicians, professionals and managers of the Tuscan Local Health Authorities and Teaching Hospitals and the endorsement of the Regional Administration. These groups are called “famiglie
professionali” and include physicians from all the Region to discuss practices and performances and propose and implement improvement initiatives.

- **Tradition**: when physicians value membership in an organization they are motivated to adhere to that organization's standards and traditions. Following the previous lever about “communities of practice” development, it is interesting to notice that these communities might themselves create the standards to develop a common sense of identity (Wenger et al., 2002). These standards (such as guidelines, shared priorities and design of care paths) translate into well-coordinated care that patients appreciate and physicians are proud of. Furthermore, these standards and the consequent and consistent performance results reinforce the proud and sense of identity of physicians with the regional healthcare system, which has been able to promote and sustain their engagement and the improvements. The “famiglia professionale” engaged in the Diabetic Foot pathway (Paper 3), for example, presented a proposal to re-design the Diabetic Foot pathway towards more integrated-care to the Regional Commission for Diabetes. The act was approved by the Regional Health Council on July 2, 2013, aiming at updating the previous Regional Administration Act n.1304 of 9/12/2003 on the organization of the DF care pathway.

The table 2 recaps the use of the levers identified in the framework by Lee and Cosgrove in the Tuscan healthcare system. Each paper of the thesis, illustrated in the following chapters, is preceded by a short summary clarifying how the described and adapted levers have been used in the specific project discussed in the paper.
Table 2: How to apply the motivational levers by Lee and Cosgrove (2014) in the Tuscan context.

<table>
<thead>
<tr>
<th>Motivation for physicians</th>
<th>How to apply it</th>
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| To engage in a noble shared purpose | - Commitment of both regional and local organizational boards and managers to listen and support physicians in driving the improvement;  
- Focus on patients stories, highlighting the need of more integrated care;  
- Stimulate physicians’ clinical interest by looking at interventions impacting on severe diseases (both acute and chronic diseases). |
| To satisfy self-interest | - Not only financial incentives, but (mostly) intrinsic incentives:  
- Professional reputation through comparisons;  
- Participation in the construction of consistent indicators, able to represent patients’ conditions and orient clinical choices;  
- Learning by opinion leaders/best performers and training initiatives focused on the spread of best practices. |
| To earn respect | - Development of “communities of practices” (or “famiglie professionali”) both at local and regional level to foster new approaches to problem-solving and improvement, help to drive strategy and transfer best practices. These communities have to be sustained by facilitators (as researchers) to orient the discussion and support the understanding of performance measurement data. |
| To embrace tradition | - The “communities of practices” (or “famiglie professionali”) might create the standards and traditions of the system and organizations to develop a common sense of identity. These standards (such as guidelines, shared priorities and design of care paths) translate into well-coordinated care, making physicians proud and enhancing their sense of identity with the regional healthcare system, which has been able to promote and sustain their engagement and the performance improvements. |

3. Research Questions and Final Outputs of the PhD research

In this thesis, the focus of the analysis is on the strategies and levers for physician engagement in decision-making processes to define the priorities of action and in quality improvement initiatives at local and regional level in the Italian context. There is not a well-developed body of knowledge about physician engagement in Italy and, even if literature from other jurisdictions provide valuable insights, it is worthwhile to consider the characteristics of the Italian health care system. In particular, more attention to regional and local contexts is required, because the Italian regional healthcare systems are based on different logics and perspectives influencing the
organization and provision of services. In this thesis, the context of analysis is the Tuscan healthcare system.

The first research question analyzed is:

- RQ1 “What are the levers to engage physicians in decision making processes in the public healthcare sector at local level?

Because of the role of physicians in every-day decisions and in the successful implementation of improvement strategies, physician engagement is needed to define priorities of actions and allocate resources at organization and system level. In particular, even if regional policies set the strategies for healthcare services provision, efficiency and equity, the local level (Local Health Authorities providers) implement these strategies into actions and in every-day decisions. In the context of everyday practices at local level, decisions on how to use resources are not driven by cost-effectiveness analyses and clear and shared priority setting processes (Airoldi, 2013), but by the individual choices of physicians on the basis on the individual needs of their patients (Nuti and Vainieri, 2013). Furthermore, because of the lack of clear priority setting processes, healthcare professionals feel not accountable of the overall costs generated by their prescriptions and therapeutic choices, since they are not engaged in an organizational (or system) shared purpose. This engagement can be achieved through the implementation of socio-technical approaches and decision conferencing techniques (Philips, 1984; Phillips, 2007) aimed at iteratively building a requisite model to support physicians and other stakeholders (managers, policy-makers, professionals and patients) in the decision-making process. Researchers’ roles is to facilitate the implementation of these approaches by both helping the physicians and other stakeholders to understand performance data in benchmarking and by guiding the discussion, in order to identify possible best practices and priorities of interventions. The most used socio-technical and facilitated modelling approaches with these characteristics are the Programme Budgeting and Marginal Analysis (PBMA) (Mitton and Donaldson 2001; Mitton and Donaldson 2004; Peacock et al. 2007; Peacock et al. 2009) and the Socio-Technical Allocation of Resources (STAR) (Airoldi et al.,2011). The paper illustrated in Chapter 2 (“Priority setting in healthcare: comparison of socio-technical approaches”) presents the implementation of a physician engagement strategy in the context of priority settings initiatives, by comparing the techniques and the decisional processes applied (phases, actors
involved, length) by the PBMA and the STAR, through some examples of application in national and international contexts (Canada, UK and Tuscany). The paper offers useful insights for the Italian healthcare system to improve the resource allocation process at local level and to share and spread improvement initiatives through an enhanced collaboration among decision-makers, managers and professionals. In particular, the socio-technical approaches support the engagement of physicians in the decision-processes by balancing the managerial/political perspective, focused on taking quick and economical sustainable decisions for the gain of the entire population, with the clinical perspective, centered on the care of the individual patients on the basis of the best evidences available. Physicians become more engaged and more conscious about the consequences of their prescriptions and therapeutic choices, adding the population-based perspective to their “personalized” medicine approach (Gray, 2013). The engagement of physicians in decision-making processes enhance collaboration and trust, allowing the development of further improvement initiatives. The project described in the third paper is actually derived from this priority setting experience in the Diabetes path of care (see also Bini and Grillo Ruggieri, 2013).

The second research question analyzed is:

RQ2 “What are the levers to engage physicians in quality improvement initiatives at a local and regional level? “

Many researchers have observed the impact of physician support on successful quality improvement efforts (Denis et al, 2013; Greer, 2008; Lammers et al. 1996), thanks not only to their formal involvement in dedicated structures and their leadership, but also to their willingness and ability to use performance measurement data. Indeed, every quality improvement project initiates when measurement data reveal gaps between expected and actual performance (Spath, 2009). Measurement and monitoring performance are the first steps in improving quality of care, by feeding data to providers for benchmarking and by identifying high performers and best practices with effective approaches to care. Of course, measurement is only part of the answer, since there will be no predictable and systematic progress unless physicians become engaged in using performance data to effect change. This engagement can be achieved through: educational interventions, audits and feedbacks, public release of performance data, peer-review processes and pay for performance mechanisms (Epstein, 2010). Peer-pressure is thus essential to stimulate improvement, since the
benchmarking and the continue discussion with peers can help in identifying and spreading best practices. The identification of “positive deviants” (organizations, but also practices and physicians that consistently demonstrates exceptionally high performance in the area of interest) (Bradley, 2009) requires concrete, widely endorsed and accessible performance measurement and “community of practices” (Ranmuthugala et al., 2011), open to share their strategies for exceptional performance. To our experience, the role of researchers as both facilitators (Franco and Montibeller, 2008; Nuti and Vainieri, 2013) and “participants” of the improvement initiatives in an action research perspective (Vallenga et al., 2009) is essential to promote the engagement of professionals and support their accountability and commitment for performance improvement. In the Tuscan context, professionals and managers are used to benchmark their performances and to be evaluated, since the Tuscany Regional Administration has entrusted the “Management and Health Laboratory” (MeS-Lab) of the public university Scuola Superiore Sant’Anna to design and implement a multi-dimensional Performance Evaluation System since 2004 (Nuti et al, 2012a; Nuti et al, 2012b). At the same time, for this reason, the researchers of the MeS-Lab were perceived at the beginning more as inspectors or evaluators and not as facilitators and participants of the improvement projects. Indeed, both in the second (“Measuring the relationship between outcomes and DRG tariffs in the treatment of Acute Myocardial Infarction: the case of Tuscan hospitals”) and in the third paper (“Overuse or value for patients? Changing clinicians’ approach in the diabetic foot care pathway”), researchers had to work a lot in order to create a positive climate and gain the trust of the physicians. Researchers supported the physicians’ discussion, creating groups of practices with professionals from all the Region and providing them with updated data focused on best practices. In this sense, the second paper provides some insights from the research-activity conducted by the Tuscan cardiologists group in evaluating the impact of physicians’ choices on system expenditures and of the use of administrative data (in particular hospitalization discharge flows) in healthcare comparisons. In order to engage professionals to discuss potential improvements in the Acute Myocardial Infarction (AMI) care pathway through the provision of more appropriate and cost-effective treatments, the paper stresses the issue of geographic variation and of the trade-off between outcomes and costs. Indeed, the paper is part of a broader project involving Tuscan cardiologists to deliver a report on evaluation and management of geographic variation in the care of cardiovascular diseases, in collaboration with the Dartmouth Institute (Wennberg and Birkmeyer, 1999). The
paper focuses on exploring the relationship between outcomes of care and the resources use to achieve the outcomes, by providing a picture of the differences among Tuscan hospitals for AMI outcomes, treatments and DRG-based expenditures. The importance of the organizational factors in the delivery of care and the use of administrative data to identify and share best practices are pointed out. The paper contributes to the debate among cardiologists to understand the possible use of administrative data to identify the causes of variation and possible equity issues in the use of resources. Gaining the trust of the cardiologists in performance data and making them engage to work the one with each other has been hard and it is still an ongoing process. Indeed, the Tuscan cardiologists, even if they use the data presented to perform in-depth analyses and audits at local level, have still not developed common practices guidelines to be implemented at regional level to improve the quality of the AMI care pathway. On the contrary, the case presented in the third paper was more successful in terms of physicians’ engagement and tangible results at regional level. Indeed, the results and best practices collected during the discussion of the Diabetic Foot Group (facilitated by the MeS-Lab researchers) were used to the approval of a new regional act that redesigned the Diabetic Foot pathway towards integrated care. Furthermore, the project supported the implementation of internal audits in the local organizations and promoted the development of training initiatives both for General Practitioners and diabetologists.

In the following table (Table 3) details of the three paper are reported in a snapshot, by summarizing:

- the research questions of each paper;
- a brief summary representing the background/theory on which the papers are based;
- some examples of similar works/cases;
- the data/cases used;
- the methodology used;
- the difficulties faced during the research;
- the contribution to the research carried out by the colleagues of the MeS-Lab;
- the contribution to the literature.
**Table 3: Snapshot of the PhD papers.**

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<tr>
<td>Journal</td>
<td>Mecosan - Management ed economia sanitaria</td>
<td>BMC Health Service Research</td>
<td>International Journal of Integrated Care</td>
</tr>
<tr>
<td>State of the art</td>
<td>Accepted for publication</td>
<td>To be submitted</td>
<td>Under revision</td>
</tr>
<tr>
<td>Research question</td>
<td>- What are the characteristics of the socio-technical approaches PBMA and STAR in terms of decision-making process and methodological techniques?</td>
<td>- Is there an association between AMI outcomes (30 days mortality) and costs (estimated as DRG-tariffs at 30 days after the index admissions) in Tuscany?</td>
<td>- How to identify and reduce unwarranted variation in the Diabetic Foot Pathway in Tuscany?</td>
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<td></td>
<td>- Which method is most suitable to the Italian context and how can it be implemented?</td>
<td>- Are there significant differences in the provision of treatments for AMI care among Tuscan hospitals?</td>
<td>- How to engage professionals in integrated-care improvement strategies and change their behaviors and practices towards a population-based approach?</td>
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<tr>
<td>Data/cases</td>
<td>5 experiences: one PBMA case in the Vancouver Island Health, 4 STAR implementations (2 in England and 2 in Tuscany). The study populations were patients hospitalized with a primary diagnosis of AMI in any hospitals of Tuscany region in the year 2012. Two case stories about the best and worst performers (Arezzo LHA and Pisa Teaching Hospital).</td>
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<tr>
<td>Methodology</td>
<td>Literature analysis and comparison of case studies Variation across Tuscan hospitals was analyzed by mean of a probit equation for 30 day hospital mortality and a linear model for log-costs. Marginal effects of the quality and DRG-based expenditures equations for each hospital were then compared to the overall sample rates to obtain the observed to expected ratios (OERs). Correlation between the cost and outcome OERs was then analyzed. Description of the DF project implemented during 2012-2014 in Tuscany, by summarizing main analyses conducted and results achieved. Case-studies analysis.</td>
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<td>Difficulties</td>
<td>- Differences in the implementation due to different cultures and aims (in the case of England and Tuscany); - Long time needed to make the managers and professionals engaged and finalized the projects. - Difficulties in the engaging the participants and make them understand the performance data and the analyses; - Difficulties in the use of regional administrative data, which are less accurate compared to clinical data. - At the beginning, difficulties in the engaging the participants and make them understand the performance data and the analyses; - After gained the physicians’ trust, difficulties in focusing on single topics and interventions, because the physicians’ will to benchmark more and more data and to have specific focus on their patients for clinical audits aims; -Difficulties related to the use of administrative data (missing information, coding issues, etc.).</td>
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<tr>
<td>Contribution to the research team</td>
<td>This piece of work contributes to the MeS-Lab research in the context of finding rooms for reallocation of resources through the benchmarking of performances and the engagement of managers and professionals (Nuti et al., 2010)</td>
<td>This piece of work contributes to the MeS-Lab research in the analyses of administrative data for healthcare comparisons and analyses of unwarranted variation (Berta et al., 2013; Seghieri et al., 2012; Nuti and Seghieri, 2014).</td>
<td>This piece of work contributes to the MeS-Lab research in its aim to provide valuable insights to all the healthcare system stakeholders in improving performances through benchmarking of data and engagement of managers and professionals (Nuti et al., 2010). In particular, this project was the first of many other initiatives involving physicians from all over the region in improving quality of care in specific disease pathways.</td>
</tr>
<tr>
<td>Contribution to the literature</td>
<td>The paper contributes to the current debate about how to engage professionals in the definition of priorities of action, making them more accountable of the costs of their prescription and therapeutic choices. It presents the advantages and the possible limitations of socio technical approaches in the Italian context, taking as example the Tuscan experiences.</td>
<td>The paper contributes to the discussion around coding issues in the use of administrative data in healthcare comparisons: To make the routine use of administrative data effective, physicians should have the chance to meet and discuss the data, compare results within the region and with other regions, with audits and focus on individual patients, in order to gain other important clinical information.</td>
<td>The paper contributes to the current debate on how to spread integrated care and how to engage professionals, which is essential to drive improvement strategies, changing clinicians’ behaviors and practices towards a population-based approach. It presents a successful initiative in the Tuscan context, which was replicated in its methods and aims in other diseases pathways.</td>
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</table>
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CHAPTER 2 Engaging professionals in decision-making processes. Priority setting in healthcare: comparison of socio-technical approaches

Considering the levers of the framework by Lee and Cosgrove (2014) revised to be suitable for the Tuscan Healthcare System, the paper “Priority setting in healthcare: comparison of socio-technical approaches” provides examples of implementation in the context of the engagement of physicians in the decision-making processes to prioritize interventions at local level. In the following table (Table 4) a summary of how the levers have been used in the Tuscan experience described by the paper is provided.

Abstract

Increasing responsibility of local authorities and increasing budget constraints raised interest in the implementation of socio-technical approaches for priority setting, such as PBMA and STAR. In this paper we compare these approaches in terms of techniques used and decisional process applied (phases, actors involved, length), providing examples of application in national and international contexts (Canada, UK and Tuscany). These approaches offer useful insights for the Italian healthcare sector on the improvement of the resource allocation process and the sharing and spreading of improvement initiatives, through an enhanced collaboration among decision makers, managers and professionals.

Keywords: priority setting; decision-making; socio-technical approaches; professionals’ engagement; PBMA; STAR
Table 4: How to apply the motivational levers by Lee and Cosgrove (2014) in the definition of priorities of action in the Tuscan context.

<table>
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<th>Motivation for physicians</th>
<th>How to apply it</th>
<th>Implementation in the Tuscan context</th>
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| **To engage in a noble shared purpose** | - Commitment of both regional and local organizational boards and managers to listen and support physicians in driving the improvement;  
- Focus on patients stories, highlighting the need of more integrated care;  
- Stimulate physicians’ clinical interest by looking at interventions impacting on severe diseases (both acute and chronic diseases). | - Focus on benefit for both individual patient and population through the application of the STAR approaches and its visual aids;  
- Focus on widespread chronic disease: heart failure and diabetes.  
- Commitment of organizational boards and managers, which participated in the meetings during the projects. |
| **To satisfy self-interest** | - Not only financial incentives, but (mostly) intrinsic incentives;  
- Professional reputation through comparisons;  
- Participation in the construction of consistent indicators, able to represent patients’ conditions and orient clinical choices;  
- Learning by opinion leaders/best performers and training initiatives focused on the spread of best practices. | - No financial incentives were used, but physicians had the opportunity to discuss data with colleagues and deep their knowledge both of the evidence-based treatments they were evaluating and of the local population needs and characteristics. Opinion leaders on specific topic (Diabetic Foot) were also participating in some meetings. |
| **To earn respect** | - Development of “communities of practices” (or “famiglie professionali”) both at local and regional level to foster new approaches to problem-solving and improvement, help to drive strategy and transfer best practices. These communities have to be sustained by facilitators (as researchers) to orient the discussion and support the understanding of performance measurement data. | - Physicians, other professionals and managers met to discuss data in benchmarking and analyze costs and benefits of the interventions. The researchers' role as facilitators of the discussion and as supporters in implementing the method and analyzing the data was essential. |
| **To embrace tradition** | - The “communities of practices” (or “famiglie professionali”) might create the standards and traditions of the system and organizations to develop a common sense of identity. These standards (such as guidelines, shared priorities and design of care paths) translate into well-coordinated care, making physicians proud and enhancing their sense of identity with the regional healthcare system, which has been able to promote and sustain their engagement and the performance improvements. | - The shared priorities of actions oriented physicians behaviors towards more integrated care and attention to preventative interventions. The most important result of the project has been the enhanced collaboration among physicians. |
1. Priority setting in healthcare: engaging decision-makers, managers and professionals at local level

Setting priorities in healthcare means to identify the interventions on which to invest or re-allocate the scarce resources available, in order to make the healthcare system more effective, efficient and equitable as possible (Hauck 2004). Nowadays, this issue has got complicated by the stricter budget constraints, the gradual aging of the population, the greater public expectations and the impressive progress of clinical and technological sciences (Mitton e Donaldson, 2004).

During economic crisis, it is always more necessary to rationalize and reallocate resources in order to guarantee quality of the healthcare services and equity of access and treatment to citizens, by reducing wastes and inefficiencies. On the contrary, as stated by Mladovsky and colleagues (2012), in the healthcare sector decision-makers are more likely to focus on the identification of areas in which cuts are easier than on the development of interventions able to create more value for patients for each euro spent. Supporting decision-making processes with well-framed approaches and methods can help policy-makers and managers to focus and act with regard to the interventions able to improve outcomes using the same or less resources. To obtain the highest value for each resource used it is necessary to take into account simultaneously costs and benefits of the interventions, avoiding to focus only on the evaluation of population needs (Mooney et al., 1986) or on the “core services” (Wordsworth et al., 1996).

The topic has an extensive literature and can be analyzed from different perspectives: the types of decisions, the institutional context and level in which the decisions are made, the decision-making process and the specific cost-effectiveness techniques applied to set priorities (Ham e Robert, 2003).

Considering the types of decisions and the institutional context in which they are made, Klein (1993) suggests the following classification on three levels:

– «macro» level: at this level there are the decisions to regarding the allocation of resources among different sectors (such as healthcare services, education etc.) to improve population health. These decisions are usually made by policy-makers at national level, without applying any cost-effectiveness techniques in an explicit and transparent way. Nevertheless, an analysis of the costs and benefits involved should be performed to support the decision-making process.
«meso» level: this level regards the choices made within the healthcare services. These decisions are made both at national and regional level and rarely at local level. In this context, cost-effectiveness techniques can be applied in order to assess, for example, whether the healthcare system should or not refund a new drug or technology, by comparing it to the existing alternatives.

«micro» level: this level regards the choices within similar services that might be provided in in different healthcare setting (for example regarding the choice made between services provided through ordinary hospitalization or in day hospital). These decisions are made daily by both regional and local managers and individual professionals.

In this last case, there is scarce knowledge and use of cost-effectiveness techniques, even if decisions at this level have great impact on quality, effectiveness and efficiency of the services provided, in particular in the context of a very decentralized organizational structure as in the Italian National Healthcare System. Indeed, in Italy Health Technology Assessment methods and cost-effectiveness techniques are still scarcely implemented both at national and regional level, even with differences in the regional contexts (Ciani et al., 2012). This scarce diffusion, in particular at local level, can be related to the general difficulties for Local Health Authorities (LHAs) in using budgeting and evaluation system able to support the achievement of the desired performances (Anessi Pessina e Pinelli, 2003). In general, these difficulties are due to:
- the lack of appropriate resources and competences (Eddama e Coast, 2008; Mitton e C. Donaldson, 2002; Macinati, 2007);
- the insufficient engagement of professionals in the decision making process (Macinati, 2007).

Indeed, as highlighted by some authors (Mitton e Donaldson, 2002; Nuti e Vainieri, 2013), many healthcare organizations set priorities of action and allocate the resources without a concrete (and not just “formal”) use of planning and control instruments (Rea, 2006) and without involving appropriately the professionals. Indeed, the choices of allocation are often made just by looking at what was made in the past. The lack of a clear and well-framed priority setting process, shared with professionals, might contribute to the lack of professionals’ responsibility and accountability for the costs generated by their prescriptions and therapeutic choices, thus affecting the variability of performances and damaging the equitable delivery of the healthcare services.
Professionalizing the different actors at local level, providing them with the specific techniques and approaches to reframe the decision-making process, would help in improving the setting of priorities and the allocation of resources, which is now potentially sub-optimal. To this end, the literature underlines the importance to develop “socio-technical” approaches, able to combine the analytical evaluation of costs and benefits with a participant social process with local stakeholders (Phillips, 2007; Phillips et al. 2007). The most used socio-technical approaches are the well-known Program Budgeting Marginal Analysis (PBMA) and the recent Socio-Technical Allocation of Resources (STAR). Literature about these approaches focuses mainly on the description of the different methods and the principles at their basis and on providing case-studies of implementation in different contexts (Baltussen e Niessen, 2006). Instead, aim of this paper is to focus on the structuring of the decision-making process ns on the specific techniques adopted by the PBMA and the STAR, in order to provide researchers, decision. Makers and professionals with useful insights for the implementation at local level. The paper compares the decision-making process and the techniques adopted by the two socio-technical approaches through the description of their application in Canada, UK and Italy.

2. Methods

The socio-technical approaches PBMA and STAR are analyzed individually and then compared, considering:
- the technical aspect, by identifying the evaluation techniques adopted and their formalization and standardization;
- the social aspect, by describing phases, actors involved and timing of the decision-making process.
A literature analysis has been the basis of both the individual description of the approaches and of their comparison.

In particular, considering the technical aspect, for the PBMA the manual by Mitton and Donaldson (2004) was used as the main reference together with two articles of the same authors (Mitton e Donaldson, 2001; Mitton et al. 2003). For the STAR, the Italian chapter by Bevan (2013) Nuti and Vainieri’s monograph (2013) was analyzed, since it summarizes the previous works of the London School of Economics (LSE) research team (Airoldi et al. 2011) for the Health Foundation (Airoldi e Bevan, 2010; The Health Foundation, 2012), which funded the development of the STAR approach.
Considering the social aspect, for both the approaches we analyzed their implementation in some local experiences, in order to understand how the decision-making process can be structured, who conducts it, who is involve and with which roles and how long it lasts. In particular, for the PBMA the case of the Vancouver Island Health Authority (VIHA, one of the six LHAs of British Columbia, Canada) in 2006-2007 reported in the paper of Dionne et al. (Dionne et al. 2009) is described. For the STAR, the description of the implementation in the English Primary Care Trust (PCT) of Isle of Wight and Sheffield (Airoldi e Bevan, 2010; The Health Foundation, 2012) and in the Tuscan LHAs of Pisa and Empoli is provided (Nuti e Vainieri, 2013).

3. The principles at the basis of the Program Budgeting Marginal Analysis (PBMA) and the experience implemented in the Vancouver Island Health Authority

The Program Budgeting Marginal Analysis (PBMA) is an international evaluation approach which has been used in healthcare organizations since the 1970s especially in English speaking countries. It has been applied both in evaluating individual interventions in the same area and in broader comparisons for the approval of new technologies (Mitton and Donaldson, 2004). With this approach, both professionals and managers are required to meditate on the mix of services provided and their resources allocation in order to optimize the value created.

The technical aspect

The PBMA provides the decision-makers with a framework that takes into consideration clinical evidences (from different sources) and local data at the same, providing useful insights about the appropriateness to expand a specific intervention/service and about the identification of the resources need for its expansion (Mitton et al., 2003).

This framework is made up by two components (Mitton e Donaldson, 2004):
- the program budget, which allows to decline the budget on several interventions/pathways until the single procedures and equipment;
- and the marginal analysis, which allows to analyze the changes of the selected interventions/pathways in terms of costs and outcome generated.

The program budget provides the decision-makers with information about the resources available and their current allocation on the services/interventions of the organization. This is the starting point to re-allocate resources and reshaping the
interventions in the organization. The marginal analysis is based on the concepts of “opportunity cost” and “margin”. The opportunity cost is related to the fact that an intervention provides benefits but also the loss of other potential benefits, which might have been obtained by investing the resources to fund the intervention onto to other services. The opportunity cost of all the interventions considered is needed in order to make more effective and efficient choices to identify the most suitable mix of interventions and their priorities. In this context, the concept of margin is important, since it indicates on which interventions to allocate the resources in order to gain the greatest benefits or from which interventions to disinvest resources, loosing benefits as less as possible. The marginal analysis examines how a different allocation of resources might generate more or less benefits, looking at all the services provided, maximizing the value generated from the available resources. In this sense, the best mix of interventions can be obtained by examining the “margin” of the costs and benefits of the interventions, considering the extra unit of value generated with an extra unit of resources spent. Nevertheless, in the PBMA the benefits are not evaluated with standardized methods, but on the basis of criteria defined locally with multi-criteria techniques to compare the different options. This provides the approach with a lot of flexibility and adaptability to local contexts, but it makes more difficult the comparisons of different experiences, since there is no uniformity in the techniques used. Therefore, in the PBMA there is no standardized techniques to estimate the benefits of the interventions and neither a uniform way to synthetize the information collected and the results of the analyses (there are just some templates produced at local level in single experiences).

The social aspect of the decision-making process

Phases

The implementation of the PBMA approach begin with the analysis of the current allocation of resources on the interventions, services and pathway provide by the healthcare organization. Then decision-makers must evaluate advantages and disadvantages of a different allocation of resources among pathways and interventions, through measurable and consistent criteria. This evaluation process is articulated in 7 main phases (Peacock et al., 2006):

- **Defining the aim and context of application of the priority setting process:**
  the aim can be to allocate additional resources, to re-allocate existing ones, or
to disinvest resources. Furthermore, the context of application can be the evaluation of interventions within an individual program/pathway or the comparison among different programs/pathways.

- **Compiling the program budget**: identifying the current allocation of resources is important in order to understand how to start the priority setting process. Furthermore, there is the need to identify the resources to be allocated to new initiatives and to estimate how many resources to re-allocate/disinvest.

- **Settling the advisory panel for the marginal analysis**: the advisory panel that analyzes the interventions should be composed by the main stakeholders of the healthcare organization (managers, professionals, patients, etc.) and should be guided by a “local champion” within the organization (Kemp and Fordham, 2007).

- **Defining the evaluation criteria for the interventions by the advisory panel**: the advisory panel must define the evaluation criteria for the interventions, considering the objectives and the constraints set at national, regional and local level. These criteria can be weighted on the basis of their importance.

- **Identifying the area of investment and disinvestment/re-allocation**: the area are chosen by the advisory panel using the information contained in the program budget, the clinical evidences on the benefits of the interventions and the local data related on the needs of the population served by the organization. The disinvestment/re-allocation choices can be achieved both through the reduction/elimination of services and efficiency improvements.

- **Evaluating the proposal of investment and disinvestment**: the interventions/initiative are evaluated both in terms of costs and benefits generated according to the criteria identified by the advisory panel. Every initiatives must contain useful information for its actual implementation.

- **Validating the results and allocating the resources**: the results of the analyses are checked and validated according to the criteria adopted by the advisory panel, considering both their costs and benefits. Then the resources are allocated on the best interventions/initiatives resulted and disinvested by the ones with lower value.
These phases are detailed in the Table 1 through their implementation in the Vancouver Island Health Authority (VIHA, one of the six Local Health Authorities of British Columbia, Canada) during 2006-2007 (Dionne et al., 2009).

Table 1: The phases of the PBMA process: the VIHA case (Dionne et al., 2009)

<table>
<thead>
<tr>
<th>Phases</th>
<th>Implementation of the PBMA phases in the VIHA during 2006-2007, (Dionne et al., 2009).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 Defining the aim and context of application of the priority setting process</td>
<td>The PBMA was implemented in the entire healthcare organization since 2005 in order to re-allocate resources among programs and pathways. During the first year, the initiatives directly funded by the regional government were excluded from the analyses, but they were then evaluated in the second year.</td>
</tr>
<tr>
<td>Phase 2 Compiling the program budget</td>
<td>The current allocation of resources was identified thanks to the support of the programming and control department.</td>
</tr>
<tr>
<td>Phase 3 Settling the advisory panel for the marginal analysis</td>
<td>The advisory panel was composed by all the senior managers (board members, head physicians), some middle managers and healthcare leaders.</td>
</tr>
<tr>
<td>Phase 4 Defining the evaluation criteria for the interventions by the advisory panel</td>
<td>Evaluation criteria were identified, but they were not weighted. At the beginning, some criteria were unclear and vague. For example, the criteria “Health and wealth”, related to the ability of the interventions analyzed to improve the population health, was not measured with established methods (such as the additional number of life-years gained, etc.) and there were no standard to assess its impact (scarce, medium, great impact…). Other criteria were the ease of access, the promptness of the intervention, patients’ safety, patient centeredness, ability to improve work conditions and ability to generate revenues or increase efficiency. During the process, the importance to define clear and consistent evaluation criteria was stressed. In the second year of the VIHA project, the evaluation criteria were revised to allow a more precise assessment of the benefits and a more accurate evaluation of the proposals of investment and disinvestment.</td>
</tr>
<tr>
<td>Phase 5 Identifying the area of investment and disinvestment/re-allocation</td>
<td>Many investment and disinvestment initiatives were proposed in the first year. In order to encourage high quality and evidence-based proposals, the number of investment proposals was limited to 20 (7 in healthcare services and 13 in administrative and support services) during the second year. Furthermore, all the interventions of the following years had to include disinvestment proposals equal to the 1% of its previous year budget. A specific template was used to compile both the investment and disinvestment proposals in order to highlight the sources of evidences reported.</td>
</tr>
<tr>
<td>Phase 6 Evaluating the proposal of investment and disinvestment</td>
<td>The advisory panel evaluated all the proposals according to defined criteria. In the second year, the criteria became more robust, explicating the weights and guaranteeing a more transparent evaluation of the costs and benefits of each intervention.</td>
</tr>
<tr>
<td>Phase 7 Validating the results and allocating the resources</td>
<td>The results of the analysis were presented by the organizational board and the resources were allocated accordingly. Between May and June 2006 $ 46 million were invested on 2 proposals and $ 15 million were retrieved from 54 disinvestment initiatives. The resources disinvested were thus able to balance the deficit of the organization, that the previous year amounted at f $ 14 million. The organizational board decided not to disinvest all the 15 million but just 14, without any reallocation among programs/initiatives. During the second year, reallocation among programs/initiatives was performed for about 4.5 million (out of the 10 considered for disinvestment proposals) in order to fund interventions with higher value-for-money.</td>
</tr>
</tbody>
</table>
Actors involved in the decision-making process

The member of the advisory panel and the “local champion” are the key actors involved in the decision-making process. The advisory panel identifies and evaluates the areas/interventions on which to invest or disinvest resources. The advisory panel should include an appropriate number of members, representing the main stakeholders to be involved in the decision-making process. The composition of the advisory panel and the ability of the members to identify and evaluate the interventions are essential for the success of the PBMA approach. The advisory panel should not include too many members, in order not to compromise the discussion of the interventions, but, at the same time, it should be representative of the main stakeholders according to the characteristics of the local context. In general, managers and clinicians involved in the interventions analyzed are part of the panel. Often the financial department is involved too in order to gain information about costs and the allocation of resources. The “local champion” is a managerial and/or clinical expert, respected by his peers, with a recognized role in the system and with at least basic knowledge of PBMA mechanisms. Indeed, the local champion role is to spread the PBMA approach and to guarantee the implementation of the project thanks to his reputation and expertise (Kemp e Fordham, 2007). His presence is thus considered essential for a successful implementation of the PBMA approach.

Timing of the decision-making process

PBMA implementation times are usually quite long, even if learning by replicating the approach in consecutive years has as important role in reducing them. Firstly the PBMA approach should be implemented in areas with easy-achievable targets of investment/disinvestment in order to support the learning and motivating the advisory panel and the stakeholders in replicating the approach. The process in the VIHA case (Dionne et al., 2009) started at the end of 2005 with training sessions aimed at disseminating the PBMA methodology and then, in the following two years, proposals of investment and disinvestment were assessed. Dionne and her colleagues (Dionne et al., 2009) state that the PBMA implementation did not require additional times and resources compared to the budgeting process in use in the organization at that time.
Nevertheless, the process of implementation had been more difficult during the first year, whereas it improved in the following years. Indeed, the focus during the first years was on the areas where the cuts were easier to be achieved than on the interventions able to provide higher value. This had been done in order to facilitate the implementation, that during the first year is difficult because the people involved do not know the approach and the methodology, and to motivate the advisory panel to keep using it. The cuts of resources, however, were done only after the evaluation of the areas with defined and transparent criteria both in the first and in the second year, thus avoiding to reduce all the funded initiatives with the same percentage. The next year the evaluation criteria were improved, impacting on the allocation of resources.

4. The principles at the basis of the Socio-Technical Allocation of Resources (STAR) and the experiences implemented in the English PCTs and in Tuscan LHAs

The Socio-Technical Allocation of Resources (STAR) approach is an output of the research program “Systems Modelling and Performance Systems Modelling for Performance Optimisation and Service Equity (Sympose)” lead by the London School of Economics (LSE) and funded by the Health Foundation between 2008 and 2010 (Airoldi et al., 2011). The STAR approach can be considered a “facilitated modelling” (Franco e Montibeller, 2008) since it includes both an analytical evaluation of costs and benefits of the interventions and a participant social process with a group of local stakeholders involved in the priority setting issues.

The technical aspect

The STAR approach bases on five main characteristics linked to epidemiology and health economics sciences (Bevan, 2013):

- **Cost-Effectiveness Analysis (CEA):** interventions assessed with CEA techniques are evaluated considering the ratio benefits/costs in order to highlight their impact in terms of marginal health gain per unit cost. In the STAR approach, benefits are measured in Quality Adjusted Life Years (Qaly) and the costs in financial units, considering only the costs sustained by the healthcare system.

- **Burden of Disease (BoD):** the BoD gives information about the prevalence or incidence of a specific disease in the population of interest. In the STAR
approach these data are useful to estimate the number of potential beneficiaries of an intervention.

- **Avoidable mortality**: avoidable mortality consists in the quantifications of deaths avoidable thanks to actual technologies/knowledge. This data alone cannot be used to identify priorities of action since it does not consider the quality of life of the patients and the BoD. In the STAR approach the data about avoidable mortality is used together with all the other aspects to inform the decision-making process.

- **Estimation of healthcare needs**: in the STAR approach, need assessment is based on the concept of “need” not as the presence of a disease but as the ability to benefit from a specific intervention aimed at curing/relieving the disease. Indeed, the presence of a disease alone do not give any indication about how to prioritize the interventions.

- **Evidence-based medicine (EBM)**: EBM considers randomized control trials as the best evidence to be used in order to compare different intervention aimed to cure/relieve the same disease. Nevertheless, data from trials are difficult to be adapted to local population, since the populations in the trials are usually selected with very specific criteria. Furthermore, there are no trials for all the interventions of a specific pathway and there are no trials comparing interventions across different pathways/diseases. In the STAR approach, the sources of clinical evidences are not only the ones from trials, but also the ones from observational studies, case studies and professional expertise, in order to assess all the interventions of interest.

The STAR approach uses visual aids (Figure 1) to facilitate stakeholders understand of multi-criteria evaluation techniques. In particular:

- The rectangles represent the benefits generated by the intervention of interest on the population (the potential beneficiaries). The horizontal side of the rectangle represents the number of potential beneficiaries of the intervention in the population, whereas the vertical side represents the expected benefit for patient in Qalys. The area of the rectangles is the product between the number of beneficiaries and the expected benefit for patient is the expected benefit for the population.

- The triangles represent the Value for Money (VfM) of each intervention. The horizontal side of the triangle represent the cost of the intervention for all the
potential beneficiaries in the population, whereas the horizontal side represent the expected benefit for the population (the area of the rectangle described above). The shape of the triangle gives an indication of the VfM of the intervention, with a steeper gradient representing better VfM.

- The efficiency frontier ranks all the interventions evaluated by their VfM. The triangles with the highest VfM will be on the left-hand side of the graph, while the lowest VfM will be on the right. In this way, it is possible to optimize the expected benefit for the population for each level of resources available.

Figure 1: STAR approach visual aids (The Health Foundation, 2012)

The social aspect of the decision-making process

Phases

The STAR implementation process is articulated in the following 8 phases:

- **Identifying the interventions:** on the basis of the aims of the organization (allocation of new resources, reallocation, disinvestment) the interventions to
be evaluated are identified. In order to do so, it is important to consider the structural and funding characteristics of the organization (programming and provision of healthcare services separated or integrated, etc), since these characteristics impact on the identification of the interventions and on the types of stakeholder to engage in the process.

- **Defining the criteria to assess the benefits of the interventions**: the criteria can be defined locally, as in the PBMA approach, but in general the Qalys are used and eventually weighted with other factors considering equitable access to services and the reduction of healthcare gaps among groups.

- **Estimating the benefits of each intervention**: Qaly gains of the interventions are firstly searched in literature. Often these Qalys need to be adjusted according to the characteristics of the target local population of the interventions and weighted for the other criteria defined (for example by attributing a higher value to the interventions able to improve the health of a disadvantaged group). Furthermore, if there are no Qalys in the literature for a particular interventions, the group of stakeholder (in particular the physicians and the other healthcare professionals) estimate them with the support of a facilitator (see the section “Actors involved in the decision-making process”).

- **Calculating the benefits for the target population**: the benefit identified at individual patient level has to be multiplied for the number of potential beneficiaries of each intervention in order to obtain the benefit for the entire target population (see the rectangles described in “the technical aspect”).

- **Estimating the costs of each intervention**: the actors involved, often supported by the financial department of the organization, estimate the costs for the implementation of each intervention for the target population.

- **Calculating the Value-for-Money of the interventions and ranking them in the efficiency frontier**: the VfM of each interventions has to be represented by the triangles described in the previous section and then all the interventions are ranked in the efficiency frontier.

- **Testing the model with sensitivity analysis**: the values estimated for costs and benefits of the interventions should be tested with sensitivity analyses. Simulations on the results of the model (costs and benefits values) end when the model become “requisite”, which means, according to the decision conferencing techniques, sufficient to solve the concerns [Phillips 1984].
• **Setting the priorities:** the decisions of allocation/re-allocation/disinvestment are taken consistently with the results of the model.

Table 2 illustrates the implementation of the described phases in the UK and Tuscany contexts. First implementations of the STAR approach were in the Primary Care Trust (PCT) of the Isle of Wight and in the of PCT of Sheffield in 2008 and 2009 (Airoldi et al., 2010; The Health Foundation, 2012), whereas the implementation in the Tuscan LHAs of Pisa and Empoli were in the years 2009-2011 (Nuti e Vainieri, 2013).
Table 2: The phases of the STAR process: the cases of the English PCT (Airoldi et al., 2010; The Health Foundation, 2012) and Tuscan LHAs (Nuti e Vainieri, 2013)

<table>
<thead>
<tr>
<th>Phase</th>
<th>The Isle of Wight PCT and the Sheffield PCT</th>
<th>Pisa LHA and Empoli LHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 Identifying the interventions</td>
<td>In the Isle of Wight PCT (a PCT with an integrated model of programming and provision of services), the aim of the Star project was to allocate new resources (£1 million) on five key areas (cardiovascular diseases, cancer, respiratory diseases, child health &amp; mental health) through 21 interventions assessed. In the PCT of Sheffield (which has a separated management of the programming and the provision of the healthcare services), the aim of the STAR project was to reallocate about £1.5 million in 2009 in the eating disorders services. The managers of the Sheffield PCT decided to implement the STAR approach in their PCT after having discussed the experience of the Isle of Wight PCT at the London School of Economics.</td>
<td>Tuscany Regional Administration decided to assess the interventions related to the chronic diseases described in the Regional Health Plan of the 2008-2010 (Regione Toscana, Piano Sanitario Regionale 2008-2010), without a defined program of allocation/reallocation of resources. The main diseases considered were Heart Failure (which pathway was analyzed both in Pisa and Empoli LHAs) and Diabetes - Type 2 (which pathway was assessed only in Empoli LHA). Researchers and professionals shared methods and data about the incidence of the chronic disease in the LHAs territories. Professionals decided to analyze routine interventions (such as pharmacological treatment), strategic regional interventions (such as the Chronic Care Model) and innovative interventions (such as the use of the eco-cardiogram in the Medicine ward and the extension of the home care intervention to all the heart failure patients in NYHA class III and IV).</td>
</tr>
<tr>
<td>Phase 2 Defining the criteria to assess the benefits</td>
<td>The benefit of each intervention has been estimated in Qalys and the costs assessed with the support of the financial department. In case of missing data on benefits or costs, professionals and the other stakeholders estimated them on the basis of their expertise in order to provide data for all the interventions of interest. In the Isle of Wight PCT the stakeholders assessed the interventions also considering their impact on the reductions of healthcare gaps, providing a higher benefit estimation to the interventions that improved the health of more disadvantaged groups. The efficiency frontier was used to discuss possible reallocations of resources. An external facilitator (a researcher from the LSE) was involved to support stakeholders in understanding the method and defining the criteria to assess the costs and the benefits of the interventions.</td>
<td>The benefits of the interventions were estimated in Qalys (Qalys lifetime for the diabetes pathway and Qalys gain after one year of the interventions for the heart failure pathway), looking at the research studies in the literature with similar interventions. Furthermore, for each intervention number of potential beneficiaries, costs and probability of success of the intervention were estimated. Mes-Lab researchers guided the discussions among the stakeholders and collected bibliographic and local administrative data to support the decision-making process and the ranking of the interventions in the efficiency frontier.</td>
</tr>
<tr>
<td>Phase 3 Estimating the benefits</td>
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<td></td>
</tr>
<tr>
<td>Phase 4 Calculating the benefits for the target population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 5 Estimating the costs</td>
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<tr>
<td>Phase 6 Calculating the VfM and ranking the interventions in the efficiency frontier</td>
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</tbody>
</table>
Phase 7 Testing the model with sensitivity analysis

The benefits and costs were tested with sensitivity analyses, resulting robust and consistent. In the Sheffield PCT, the model demonstrated that additional investments in preventative services would have saved about £ 400,000 and improved target population health. In the Isle of Wight PCT, on the contrary, the analysis highlighted possible limitations of the model, since the stakeholders were not able to assess the value of palliative services. In this case, these services were thus not considered in the analysis.

Sensitivity analyses were performed in order to assess the probability of success of the interventions and their costs and benefits. The results were consistent with the indications of most guidelines (but also regional strategies) focusing on the impact of preventative interventions and integrated care approaches as opposed to traditional care approaches.

Phase 8 Setting the priorities

The decision conferencing techniques helped the facilitator and the stakeholders to define the. In the Isle of Wight PCT, the stakeholders-facilitator meetings included all the stakeholders involved in the different interventions assessed. In the Sheffield PCT the stakeholder group was broader since not only managers and professionals were involved but also patients and no-profit associations’ representatives.

The priorities were identified by the stakeholders of each disease-group in each LHAs. There were few plenary meetings and there were no shared decision making among the two LHAs. On the contrary, even inside the main pathways of care (e.g. the heart failure pathway) the analysis was very detailed, distinguishing costs, benefits and frontiers on the basis of the severity of patients (e.g. in the heart failure pathway the groups opted for two efficiency frontiers: one for patients with mild heart failure and NYHA class I-II and one for patients with severe heart failure, in NYHA class III-IV).

The social aspect of the STAR approach and the use of the visual aids are the main common elements for all the cases implementing the approach. There are however differences in the implementations both within countries/regions and between countries/regions.

Considering the English PCTs, there are differences due to the specific characteristics of their funding and organizational models: in the Isle of Wight the organization is similar to the Tuscan LHAs, with integration between programming and provision of services, whereas the PCT of Sheffield their management is separated. Furthermore, in the PCT of Sheffield the focus were the eating disorders services, whereas in the Isle of Wight the interventions to be assessed regarded five areas: cardiovascular diseases, cancer, respiratory diseases, child health e mental health. Finally in the Isle of Wight case the aim was to allocate new resources (£ 1 million) in order to improve population health and reducing health gaps, whereas in the Sheffield case £ 1.5 million needed to be re-allocated to improve efficacy and efficiency of the eating disorders services. Thanks to the project the PCT of Sheffield was able to save £ 400,000 and improve target population health by reducing the hospitalizations in private institutes and reallocating the resources on preventative services for a greater number of
beneficiaries. These savings were actually achieved through the implementation of a shared-risk model with the local services: if the local services were not able to decrease the number of hospitalizations, they would had shared their costs (Nuti e Vainieri, 2013). In the Isle of Wight case the resources were allocated successfully on high VfM initiatives, with positive impact on performances and population health (for example, after the project the accesses to the Emergency Department for asthma decreased by the 50%, thanks to the improvement of local services). Only the intervention about the palliative services was considered aside, since the stakeholders were not able to compare its value with the ones of the other interventions.

About the differences between the English and Tuscan implementations: in the Tuscan cases the Regionals Administration did not define the precise amount of resources to be reallocated in the pathways of interest (heart failure and diabetes – type 2), because the aim was to investigate all the interventions with an innovative approach and then think about the potential reallocation/changes. On the contrary, for the English PCTs there was a clear economic aim: the allocation of £ 1 million in the Isle of Wight and the re-allocation of £ 1.5 million in the PCT of Sheffield. Therefore, in the English PCTs the economic aims were achieved, whereas in the Tuscan cases, since there was no economic aims from the beginning, there were no immediate actual allocations/reallocations of resources. Nevertheless, a questionnaire investigating the satisfaction of the Tuscan stakeholders after the STAR project in the heart failure pathway highlighted that the approach was thus able to enhance the collaboration among professionals and between professionals and managers, increasing also the awareness and accountability of physicians of the impact of their prescriptions and therapeutic choices. Finally, the assessment of the intervention about the “Prevention of the Diabetes-Related Major Amputation at lower limbs” in the diabetes – type 2 pathway inspired a specific project to improve the quality of the Diabetic Foot services in the Region (see Bini e GrilloRuggieri, 2013 and the last article of the thesis). Other differences between the English and Tuscan cases regarded the actors involved and the timing of the decision-making process.

Actors involved in the decision-making process

The key actors involved in the decision making process of the STAR approach are: the local stakeholders and the external facilitator. The STAR process is based on the decision conferencing principle (Phillips, Bana e Costa 2007; Phillips 2007) and is
articulated in work-meetings with local stakeholders, guided by an external facilitator
to build an analytic decision-making model together. From the first model defined,
stakeholders discussed the results of the interventions (in terms of costs, benefits,
probability of success and number of beneficiaries) and change the model again until
they are satisfied and agreed on the allocation/reallocation of resources and the
benefits generated. In both English and Tuscan cases the facilitators were researchers
from important university centers (the Department of Management of the LSE and the
Mes-Lab of Scuola Superiore Sant’Anna, Pisa). Their role was to guide the discussion,
to provide data and evidences to help the decision-making process and to support
the stakeholders in the use of the STAR techniques. The stakeholders involved, both in
Tuscany and UK, were managers and professionals, both general practitioners and
specialists, who had an important role as scientific discussants of the benefits of the
interventions analyzed (Nuti e Vainieri, 2013). In the English PCTs there were also
representatives of no-profit associations (in the Sheffield case) and patients (in the Isle
of Wight case).

Timing of the decision-making process

The implementation of the STAR approach in the English PCTs lasted few months
with impacts in the short-term, whereas in the Tuscan cases it lasted more than a year
with actual results only in the long term. This difference is due to several factors:
1. Different aims in the implementation of the STAR approach. As already
highlighted, in the Tuscan cases there was no explicit economic aim about
resource allocation/reallocation, since the focus was on the investigation of the
different intervention through the innovative application of the STAR approach in
the Italian context.
2. Different evaluation of the benefits of the individual interventions by the Tuscan
professionals. The Tuscan professionals, even if they agreed on the need to
estimate values in case of missing clinical evidences for the specific interventions,
were not comfortable in this process and preferred to base their judgments on
literature studies. This decision allowed greater transparency in the estimate of the
benefits but required longer times and more intensive research for the facilitators
(Nuti e Vainieri, 2013). Furthermore, this choice focused the attention on the
potential benefits of the interventions for the “average patient”, thus limiting the
attention for potential benefits for particular groups of patients, for example
through the reduction of health gaps. Nevertheless, the Tuscan stakeholders tried to take into account the different patients’ needs in the specific pathway and interventions by making different evaluations on the basis of the severity of patients conditions (as in the case of the heart failure pathway) and thus building different efficiency frontiers.

3. Different habit to the use of evidence-based approaches between UK and Italian contexts. As highlighted also by the results of the questionnaires to the stakeholders of the Tuscan heart failure case, the Italian decision-making approach is based on intuition and long discussions and sharing with peers and colleagues. On the contrary, the UK decision-making approach is based on the use of evidences and defined and transparent criteria of assessment (Nuti e Vainieri, 2013).

Table 3 summarizes common characteristics and differences in the implementation of the STAR approach between UK and Tuscan contexts.
Table 3: The STAR approach in the UK and Tuscan contexts: common characteristics and differences

<table>
<thead>
<tr>
<th>Common characteristics</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Phases of the process: the social aspect is the same in both English and Tuscan cases.</td>
<td>- Presence of a defined economic aim: in the English cases the economic aim (both of allocation or reallocation) was explicit, whereas in the Tuscan ones it was not. Indeed, in the Tuscan context the main aim was to test an innovative approach. The English PCTs achieved their economic goals, whereas in the Tuscan LHA there were no immediate changes in the allocation of resources among interventions.</td>
</tr>
<tr>
<td>- The use of the visual aids to represent the interventions’ costs and benefits and their ranking in the efficiency frontiers.</td>
<td>- Engagement of no-profit associations’ representative and of patients: in the English PCT these stakeholders were involved in the decision-making process, whereas in the Tuscan none they were not.</td>
</tr>
<tr>
<td>- Researchers’ roles: researchers had the roles of external facilitators, guiding the discussions, supporting the stakeholders with data and evidences and helping in the understanding and use of the STAR techniques.</td>
<td>- Timing of the implementation and criteria for evaluating the benefits of the interventions: the implementations in the English PCTs lasted few months, whereas they took more than one year in Tuscany. This is due not only to the different habits of using evidence-based approaches in UK and Italy, but also to the different evaluation criteria chosen in the Tuscan case for the benefits of the interventions. The benefits were all collected by literature analysis, thus extending the timing of implementation for the extensive literature analysis. Furthermore, in the Tuscan case, there were no criteria to estimate the impact of an intervention in reducing health gaps, but different evaluations and frontiers were made considering the severity of patients’ diseases.</td>
</tr>
<tr>
<td>- Professionals and managers opinions about the STAR approach: both Tuscan and English stakeholders participating in the project recognized the ability of the method to facilitate sharing and discussion among professionals and among professionals and managers, providing them with shared terminology and transparent criteria for evaluation.</td>
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</tbody>
</table>

5. Comparison of the two approaches

PBMA and STAR approaches represent useful instruments to facilitate sharing and discussion between professionals and managers in the priority setting process. Both the approaches enhance the engagement of the different stakeholders, even if with differences in both the technical and in the social aspects. Tables 4 summarizes common characteristics and differences between PBMA and STAR approaches.
Table 4: Comparison between PBMA and STAR approaches: common characteristics and differences.

<table>
<thead>
<tr>
<th>Common characteristics</th>
<th>Differences</th>
</tr>
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<tbody>
<tr>
<td>- Use of data based on scientific evidences and reasonable estimates made by the stakeholders involved in the process on the basis of shared and rigorous criteria.</td>
<td>- Use of criteria defined locally by the advisory panel in the PBMA approach in respect to the defined framework of the STAR approach. The STAR framework is based on the cost-efficiency principles, the use of Qalys as benefits measures and on the possibility to weight them with additional criteria such as equity judgments.</td>
</tr>
<tr>
<td>- Process phases and engagement of managers and professionals to the decision-making process.</td>
<td>- Visual aids and standardized instruments to support calculation and understanding in the STAR approach.</td>
</tr>
<tr>
<td>- Need of strong commitment by the organizational boards for the implementation of the approaches.</td>
<td>- Presence of a local champion supporting the process in the PBMA approach in respect to the roles of researchers as external facilitators</td>
</tr>
<tr>
<td>- Complexity and long timing of the first implementations (except that in the English cases).</td>
<td>- Higher efficacy of the STAR approach in the re-allocation and disinvestment of resources in respect to the PBMA approach (according to the experiences conducted until now).</td>
</tr>
</tbody>
</table>

The technical aspect

In the PBMA approach, the advisory panel is free to define the criteria and weights for evaluating the interventions. The use of locally defined criteria makes the PBMA approach very adaptable to local needs and characteristics, but at the same time it makes difficult to formalize the criteria from a theoretical point of view (Thokala e Duenas, 2012) and to evaluate them, since they are often conflicting in the different experiences (Mullen, 2004). Indeed, it is not clear whether and how cost-effectiveness and evidence-based principles are included in the decision-making process of the PBMA approach, because each local experiences is unique. On the contrary, the STAR approach offers a defined framework for evaluating the benefits of the interventions, through the use of Qalys gained in the target population, considering the probability of success of the interventions and the number of potential beneficiaries. The STAR approach presents clear and friendly visual aids (excel sheets, on-line guidelines and documents, etc.) which help in using cost-effectiveness and evidence-based principles in the evaluation of the interventions. Both PBMA and STAR approaches do not need perfectly accurate data, often not available in prompt times, but they can be based on reasonable estimates made by the stakeholders.
involved in the decision-making process through shared and rigorous criteria. The STAR approach’s criteria are more standardized, thus allowing comparisons among different experiences and more objective analysis. At the same time, the STAR approach offers the possibility to personalize the criteria to adopt them to the local contexts, by adding clear and explicit weights of the other criteria of interest. For example, as described for the English cases, it is possible to assign a higher value to those interventions aimed at reducing health gaps among population groups. Therefore, considering the technical aspect, the STAR approach seems to offer more feasible solutions in respect to the PBMA one, since it standardizes some evaluation criteria (the use of the Qaly gains) and provides visual aids to facilitate the understanding and the comparisons of the interventions and of different experiences.

The social aspect of the decision-making process

In both STAR and PBMA approaches, it is important to assess all the intervention of the pathway of interest, in order to allocate/reallocate the resources on the interventions with higher VfM (Kemp and Fordham, 2007). To this aim, both the approaches present a decision-making process articulated in phases, which require a strong engagement and collaboration of managers and professionals. The active participation of these two groups (managers and professionals), which are often in disagreement and tend not to collaborate at all, is very important not only for a shared definition of the priorities but also to enhance communication and further cooperation. The stakeholders involved provided positive feedback (Schilling et al., 2007; Schilling e Schaub, 2008; Nuti e Vainieri, 2013), thus confirming how much the sharing of strategic choices with professionals is determinant in the actual successful implementation of the interventions to improve performances and population health (Abernethy e Stoelewinder, 1995; Nørreklit et al., 2007). The main advantages of the implementation of socio-technical approaches such as the STAR ones regard the gain of a higher level of ownership on the services provided and a higher accountability on the costs and benefits generated. Furthermore, the use of evidence-based data and shared criteria allows a more transparent and rigorous definition of the priorities of action. The Tuscan stakeholders were thus particularly enthusiastic about the use of evidences in the decision-making process, the transparency in the definition of criteria and in the engagement of different actors with different perspectives (Nuti e Vainieri, 2013).
In the PBMA cases, the commitment of the organizational boards and the presence of a local champion are essential for the successful implementation of the approach. In the STAR cases, on the contrary, being understood the importance of the commitment of all the actors involved, an essential role is played by the external facilitator. The facilitators (The LSE and Mes-Lab researchers in the cases described) are neutral and expert actors, able to guide the discussion and help the stakeholders in the use of the techniques and in the development of the decision-making process. The researchers’ roles have been highlighted as very important, in particular in the Tuscan cases (Nuti e Vaineiri, 2013), since many stakeholders stated in the questionnaires that their presence was essential to implement the approach correctly and to collect the data for the analyses. Indeed, both PBMA and STAR approaches, even if built to facilitate the decision-making process in setting priorities, result very complex in their first applications and need a guide (a facilitator or a local champion) to be implemented. The learning process activated with further replication of the approach, together with a long-lasting commitment by the organizational boards and the engagement of experts and facilitators, can thus help in reducing the timing of implementations. Indeed, the timing of the implementation is pretty long especially for the PBMA approach, whereas in the STAR approach less time was needed for the English cases. The Tuscan cases required more time because of the different criteria chosen to estimate benefits (in Tuscany only Qalys gains based on literature studies were used), the different aims of the Tuscan project (experimental and innovative aims compared to the economic aims of the English cases) and the different culture of the stakeholders involved (less used in the Tuscan cases to use standardized and evidence-based methods to define priorities of action). Anyway, it is important to underline that this approaches should be implemented incrementally in order to extend the stakeholders competences and awareness and to obtain greater and greater benefits in terms of reallocation of resources towards interventions with higher VfM. In this sense, the STAR approach seems to be more effective in the case of reallocation/disinvestment of resources than the PBMA approach. The PBMA is indeed more capable to “maximize the benefits for each additional unit of resources” than to re-allocate resources towards higher value interventions (Ruta et al., 2005). This is also described in the case of the VIHA (Dionne et al., 2009), where some difficulties arose in the phases of disinvestment and in the actual reallocation of resources. The STAR approach on the contrary, even if applied in few cases, seems to be effective also in
the case of reallocation of resources and in the disinvestment, as illustrated in the case of the Sheffield PCT (The Health Foundation, 2012).

6. Conclusions

Priority setting at regional and local levels should be based on shared, rational and evidence-based principles in order not to intensify actual variation in performances and outcomes, but rather to facilitate appropriateness and efficiency. The lack of clear and defined criteria for the allocation/reallocation of resources can thus lead to sub-optimal decisions, without an actual control on the benefits generated and on the resources spent.

In general, socio-technical approaches, such as the PBMA and the STAR approaches, can help in combining the managerial and social aspect of the decision-making processes (focused on sustainability, population health, short-term time for decisions) with the clinical and professional aspect (focused on the provision of best evidence-based services for each individual patient) (Shortell e Kalunzy, 2000). In these sense, socio-technical approaches can improve the communications between managers and professionals, thus supporting the managers in the use of scientific evidences and local data in the decision-making process, and helping the professionals in becoming accountable of the economic impact of their prescriptions and therapeutic choices in a population health perspective. Anyway, neither the PBMA nor the STAR approaches can provide definitive solutions to the priority setting issues and choices. Nevertheless, they can be used to set principles and guidelines to be applied in consistency with the local variable contexts (Holm, 1998). The STAR approach seems to overcome some negative/limiting aspects of the PBMA approach. Indeed, the STAR approach combines the socio-technical aspect with an evidence-based technical aspect, focused on cost-effectiveness principles, thus ensuring a higher level of scientificity to the decision-making process (Airoldi et al. 2010; Bevan et al. 2007). However, both at international level and in the Tuscan cases, the main managerial implications of these approaches consist in the ability to focus the attention of different stakeholders in the allocation of scarce resources by providing shared technical instruments and a structure social process. In this way, it is possible to make managers, professionals and researchers work together for the improvement of population health and system performance. In particular, this approach can be used by the managers to act innovative strategies in critical areas, where the engagement and the sharing of all the
actors involved is essential for a successful result. The long time taken for the implementation of these processes suggests that first applications should be made in areas where the need of change is shared by the main stakeholders. Furthermore, it would be useful to evaluate interventions/programs involving not only single organizations but a network of providers, thus implementing the approach not at local level but at regional level. The higher complexity due to the involvement of a higher number of stakeholders at regional level might be compensated by the aggregation of technical aspects (such as the collection of data and scientific evidences) and by the possible benefits of mutual learning and best practice sharing, thanks to the engagement of professionals and the implementation of peer-review mechanisms. In this sense, the socio-technical approaches (and in particular of the STAR approach) in the Italian setting can be developed in the context of regional multi-year programming, in order to define and share with the main stakeholders the priorities of the system and their progress over the years. At a later stage, thanks to the expertise gained by the different actors involved, this process might be replicated also at organizational local level in the yearly budgeting process. In this way, the budgeting process would be based not on the volumes provided but on the provision of the interventions with the highest VfM for the population. Furthermore, the transparency of the criteria used would help managers and policy-makers in making difficult decisions, such as disinvestment choices, and in justifying their actions with greater objectivity. Nevertheless, it is important to remember that this kind of approach does not provide definitive solutions to all the current issues in priority setting, but aims to provide the stakeholders (managers, policy-makers, professionals, etc.) with a framework able to describe the possible alternatives and their impacts. The shared languages and instruments of the approach would support the alignment of purposes among all the stakeholders involved, thus influencing positively on the effective implementation of the defined strategies (Phillips 2007; Phillips et al. 2007).

In this process, the engagement of healthcare professionals (in particular the physicians) is very important, because of their roles in the actual implementation of the strategies and interventions defined. The professionals should have time and opportunities to relate with their peers, comparing practices and performances, in order to improve the quality and the efficiency of the services and become more aware of the impact of their prescriptions and therapeutic choices. Indeed, in their daily activities, the professionals are not able to pay appropriate attention to the population health since they are focused on the health of their individual patients. Socio-technical
approaches, thanks to the structured decision-making process and plenary meetings, can be useful to combine “personalized and population medicine” (Gray, 2013) and support further improvement initiatives (as in the case of the Diabetic Foot project developed after the STAR implementation in the Diabetes – type 2 pathway, Bini and GrilloRuggieri, 2013).

Finally, the STAR cases illustrated in this paper highlights the important roles of the researchers as external facilitators, able to support the implementation of process and the appropriate use of the techniques and of the data. The involvement of the researchers in priority setting issues can stimulate synergies between the academic and the healthcare systems. From the healthcare system view, this would mean to have access to valuable expertise and international level perspectives, whereas for the researchers it would be a great opportunity to learn practical criticalities, experiment healthcare system challenges and contribute to their solution with an action research approach. Furthermore, from the researchers view, the study and the implementation of socio-technical approaches would help in filling the gap between theory and practice of the use of cost-effectiveness techniques in the decision-making processes related to priority setting issues. In addition, working on the field would provide researchers with actual data that can be used for further studies. Indeed, an important characteristic of this interactive approaches is that the stakeholders share data and information and ask for further data and details to improve their analyses. In this way, the diffusion and the quality of the data improve and the researchers can use them in further research and studies. In conclusions, the socio-technical approaches support the decision-making processes with transparent, objective and evidence-based instruments. They also help in sharing a common strategic vision among the different stakeholders of the system, thus supporting the improvement of services with the provision of higher value interventions in a population perspective. In particular, the recent STAR approach can provide a useful framework for decision-making process in the priority setting area, by combining the social aspect with a consistent ad clear application of cost-effectiveness techniques both in case of allocation and disinvestment/reallocation of resources. The enthusiasm of the actors involved in the Tuscan cases described in this paper and the other improvement projects derived from them suggest that the STAR approach can be successfully implemented and spread in the Italian healthcare system.
7. References


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CHAPTER 3 Engaging professionals in quality improvement strategies in clinical pathways: two regional case-studies

1. Measuring the relationship between outcomes and DRG tariffs in the treatment of Acute Myocardial Infarction: the case of Tuscan hospitals

Considering the levers of the framework by Lee and Cosgrove (2014) revised to be suitable for the Tuscan Healthcare System, the paper “Measuring the relationship between outcomes and DRG tariffs in the treatment of Acute Myocardial Infarction: the case of Tuscan hospitals” provides examples of implementation of physicians’ engagement in quality improvement initiatives at local and regional levels. In the following table (Table 5) a summary of how the levers have been used in the Tuscan experience described by the paper is provided.

Abstract

Background: the provision of healthcare services can be influenced by differences in clinicians’ behavior and judgments, since physicians are at the basis of the clinical service delivery and their performance is the primary determinant of the service value delivered to patients. In this context, variation of treatments and expenditures and their relationship with the outcomes should be investigated by engaging physicians with a population-based approach. In this study, we aimed to explore differences in the Acute Myocardial Infarction (AMI) outcomes and DRG-based expenditures among Tuscan hospitals, by using administrative healthcare data for the years 2012-2013. In particular, we wanted to focus physicians attention on the differences in the treatments provided to AMI patients, in order to understand whether there is an association between outcomes (30 days mortality) and costs (estimated as DRG-tariffs at 30 days after the index admissions).

Methods: A process of iterative meetings has been conducted by the researchers of the Management and Healthcare Laboratory (MeS-Lab) of the Scuola Superiore Sant'Anna (Pisa) with the Tuscan cardiologists since 2012, in order to stimulate clinicians to discuss and compare data on a population-based perspective. For the specific topic analyzed in this paper, baseline characteristics of AMI patients, DRG tariffs and outcomes were described and figures for hospitals variation were provided.
about unadjusted mortality at the index admission and at 30 days and also DRG tariffs at 30 days. Then, variation across Tuscan hospitals in both outcomes and tariffs was analyzed by mean of a probit equation for 30 day hospital mortality and a linear model for log-costs. In both equations patient risk-factors were included as covariates as well as dummy variables for hospital fixed-effect, in order to obtain risk-adjusted estimates of the hospital-specific fixed-effects allowing analyses of differences between hospitals. The DRG-based expenditures equation was estimated using a two-step Heckman sample selection model to take into account the sample selection bias which might rise from systematic differences between patients discharged alive from the index and those who die during the index hospitalization. Marginal effects of the quality and DRG-based expenditures equations for each hospital were then compared to the overall sample rates to obtain the observed to expected ratios (OERs). Correlation between the cost and outcome OERs was then analyzed to test for relationship between the 30-day adjusted mortality and the DRG-based expenditures at 30 days after the index admission. Finally, we focused on some specific treatments in AMI care in the 30 days after the index admission in order to provide figures about the variation in treatment intensity among Tuscan hospitals.

**Results:** There is no association between 30 days outcomes and expenditures for AMI care among Tuscan hospitals, but the treatments provided to patients vary significantly among hospitals, thus probably reflecting differences in physicians’ practices and behaviors. In particular, physicians need share regional guidelines for practices about the use of Coronary Artery Bypass surgery (CABG), Drug Eluting System stents (DES) and post-AMI rehabilitation.

**Discussion and conclusion:** Cardiologists and physicians of Tuscany region need to focus the provision of CABG, DES and rehabilitation services, in order to assess their appropriateness and possible overuse, underuse or misuse of resources. As already developed by other Italian regions (Commissione Regionale Dispositivi Medici dell’Emilia Romagna, 2011), in-depth analyses on the cost-effectiveness of treatments should be implemented in order to settle regional shared guidelines with population-based perspective. We believe that the meetings and the discussions on the results based on administrative data with the group of Tuscan cardiologists represent a good starting point for sharing of protocols and enhancing good practices. In this sense, the paper contributes to the engagement of physicians in the analyses of results calculated based on a population-based perspective in order to gain a health system approach. To make the routine use of administrative data effective in this sense, physicians should
have the chance to meet and discuss the data, compare results both with population-based approaches and with specific audits on individual patients. This would “facilitate the development and dissemination of a database for best practice and improvement based on the results for primary and secondary research” (Lilford et al, 2004) and improve the quality of the administrative data and their coding.

**Keywords:** acute myocardial infarction; physicians’ engagement; benchmarking; administrative data.

*Table 5:* How to apply the motivational levers by Lee and Cosgrove (2014) in quality improvement initiatives at local and regional levels: the case of the Acute Myocardial Infarction pathway.

<table>
<thead>
<tr>
<th>Motivation for physicians</th>
<th>How to apply it</th>
<th>Implementation in the Tuscan context</th>
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<tbody>
<tr>
<td><strong>To engage in a noble shared purpose</strong></td>
<td>- Commitment of both regional and local organizational boards and mangers to listen and support physicians in driving the improvement; - Focus on patients stories, highlighting the need of more integrated care; - Stimulate physicians’ clinical interest by looking at interventions impacting on severe diseases (both acute and chronic diseases).</td>
<td>- Focus on Acute Myocardial Infarction, by comparing outcomes, treatments and DRG-based expenditures among Tuscan hospitals. - Focus on patients’ outcomes and systems’ expenditures, in order to stimulate the debate about how to improve performances. - The Tuscany Regional Administration was interested in coping with the variation of cardiovascular diseases in general, thus sponsoring through the MeS-Lab a collaboration with the Dartmouth Institute deliver a report on evaluation and management of geographic variation in the care of cardiovascular diseases in Tuscany.</td>
</tr>
<tr>
<td><strong>To satisfy self-interest</strong></td>
<td>Not only financial incentives, but (mostly) intrinsic incentives: - Professional reputation through comparisons; - Participation in the construction of consistent indicators, able to represent patients’ conditions and orient clinical choices; - Learning by opinion leaders/best performers and training initiatives focused on the spread of best practices.</td>
<td>- No financial incentives were used, but many meetings were held to make physicians compare and share practices. The Tuscan cardiologists demonstrated great scientific expertise, but little trust in administrative data. In-depth analyses helped physicians in understanding the possible use of administrative data both at patient but also hospital and regional levels.</td>
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</table>
To earn respect
- Development of “communities of practices” (or “famiglie professionali”) both at local and regional level to foster new approaches to problem-solving and improvement, help to drive strategy and transfer best practices. These communities have to be sustained by facilitators (as researchers) to orient the discussion and support the understanding of performance measurement data.
- Peer-review process based on qualitative and quantitative analyses was carried out involving professionals in benchmarking practices, processes and outcomes.

To embrace tradition
- The “communities of practices” (or “famiglie professionali”) might create the standards and traditions of the system and organizations to develop a common sense of identity. These standards (such as guidelines, shared priorities and design of care paths) translate into well-coordinated care, making physicians proud and enhancing their sense of identity with the regional healthcare system, which has been able to promote and sustain their engagement and the performance improvements.
- The cardiologists were already a strong group of physicians in Tuscany, a “famiglia professionale” very proud of its work and of its roles. At the same time, they were focused only on their individual patients, thus impeding a population medicine approach, the spread of performances ‘accountability and the enhancement of administrative data quality. The project was thus able to make the physicians more responsible and a massive review of the hospitalizations discharges codes was enhanced in order to understand coding issues and homogenize practices.

1.1. Introduction
Variation in Acute Myocardial Infarction (AMI) outcomes and utilization of resources has been registered both between (Widimisky et al., 2010; Tiemann, 2008; Gudnason et al., 2013; Chung et al., 2014; Häkkinen et al., 2014; Schreyögg et al. 2011; Stargardt et al., 2014) and within countries (Francisci, 2008; Insam C et al., 2014) and within the same region (Rodrigues et al, 2002; Seghieri et al, 2012). In the Tuscany region (Italy), despite the average good results (PNE, 2014), Seghieri and colleagues (Seghieri et al, 2012) found significant differences among Tuscan hospitals in 30-day in-hospital mortality after AMI, only partially related to patient characteristics. Indeed, differences in outcomes and costs in the AMI care, as underlined in the literature (Gudnason et al., 2013), might be due to variation in the incidence of cardiovascular diseases, to differences in the demographics and risk factors of the populations and in the characteristics of the local hospitals, but to a large extent they remain unexplained. When geographic variation in the provision of care cannot be completely explained by patient characteristics and preferences, there is the need to engage the physicians in the comparison of data in order to identify the causes of the possible unwarranted variation (Nuti and Seghieri, 2014). Indeed, the provision of healthcare services can be influenced by differences in clinicians’ behavior and judgment, since physicians are at
the basis of the clinical service delivery and their performance is the primary
determinant of the service value delivered to the patient (Schwartz et al., 2000). In
addition, pressure for cost containment in the healthcare systems has been passed from
providers to physicians by restricting the availability of resources (Yaisawarng and
Burgess, 2006). Indeed, increasing budget constraints and higher expectations of
citizens in terms of quality of care raised interest in the engagement of physicians in
providing the best value in terms of benefits with the scarce resources available, by
ensuring equity and appropriateness of care and avoiding unwarranted variation
(Appleby et al, 2011). On the contrary, clinicians are often not aware of the variation
of the services they provide and of the impact of their treatment and therapeutic
choices on the healthcare resources, since they tend to focus on their individual
patients and not on the whole population they serve (Gray, 2013). Therefore, it is
important that physicians consider the potential trade-off between costs and outcomes,
in order to eventually reallocate the scarce resources towards more effective
interventions. As highlighted by Stargardt and colleagues (2014), recent studies on
the relationship between hospital costs and health outcomes have focused on selected
conditions on the basis of patient-level data (Jha et al., 2009; Chen et al., 2010; Romley
et al., 2011; Stukel et al., 2012). In particular, for the Acute Myocardial infarction
(AMI), four studies found a positive association between costs and outcomes
measured as in-hospital or post-hospitalization mortality (Schreyögg and Stargardt,
2010; Romley et al., 2011; Stukel et al., 2012; Stargardt et al., 2014) whereas two
studies did not find any association (Jha et al., 2009; Hakkinen et al., 2014). None of
these studies has been conducted in the Italian context.
The aim of this paper is to provide useful insights of the Italian context by illustrating
the variation in AMI outcomes (30-days mortality) and in patient costs (estimated as
inpatient DRG tariffs) among Tuscan hospitals and analyzing their relationship, in
order to discuss possible improvement interventions in improving outcomes,
appropriateness of care and efficiency in the use of resources.
In the next sections, the methods used to compare outcomes and DRG tariffs among
Tuscan hospitals and to analyze their relationship are detailed. Results are discussed
considering their possible implications for the improvement of the AMI care in
Tuscany region and for the engagement of the cardiologists with a population-based
perspective by comparing administrative data.
1.2. Methods

A process of iterative meetings has been conducted by the researchers of the Management and Healthcare Laboratory (MeS-Lab) of the Scuola Superiore Sant’Anna (Pisa) with the Tuscan cardiologists since 2012, in order to stimulate clinicians to discuss and compare data on a population-based perspective and help them to be collectively involved in the care process, encouraging a culture of collaboration and sharing of best practices. Analyses were shared and discussed during meetings in systemic and periodical peer-reviewed comparison of practices and population-based data in benchmarking to identify the determinants of the different results. In this paper some of the analyses conducted on the variation of treatments and the relationship between outcomes and expenditures are illustrated.

1.2.1 Study populations and data

The study populations were patients hospitalized with a primary diagnosis of AMI (ICD-9-CM codes 410.xx) in any hospitals of Tuscany region. AMI patients classified as 410.x2 at index hospitalization, those discharged alive within two days from the admissions were excluded from the analysis. Patients were identified from the hospital discharge records (HDRs) of Tuscany region of the year 2012. Starting from the index admission each patient was then followed for one year to measure variation in hospitalization resource use, costs and outcomes across Tuscany both at the initial AMI episode and during the post-hospitalization period.

With regard to cost measures, for each patient, inpatient DRG tariffs at the index admission and at 30 day from their admission were identified. In particular, the inpatient DRG-based expenditures at 30 days were calculated as the sum of the DRG tariffs for all the hospitalizations provided for each patient within the 30 days after the index admission (with the index admission included). Both short term and long term mortality have been considered as outcomes of interest. 30 day all-cause mortality was defined as in hospital mortality during the index admission and death occurring for any reason either during hospitalization or as out-of-hospital within 30 days from admission. Out-of-hospital deaths was obtained through a deterministic record linkage procedure of hospital discharge records from all Tuscan hospitals and the healthcare registry, using the unique patient identifier.
1.2. 2 Statistical analyses

Baseline characteristics, DRG tariffs and outcomes were described, highlighting the mean regional value and the variation (standard deviation). Figures for hospitals variation were provided about unadjusted mortality at the index admission and at 30 days and also DRG tariffs at 30 days.

Furthermore, variation across Tuscan hospital in both outcomes and tariffs was analyzed by mean of a probit equation for 30 day hospital mortality and a linear model for log-costs. In both equations patient risk-factors were included as covariates as well as dummy variables for hospital fixed-effect, in order to obtain risk-adjusted estimates of the hospital-specific fixed-effects allowing analyses of differences between hospitals. The DRG-based expenditures equation was estimated using a two step Heckman sample selection model to take into account the sample selection bias which might rise from systematic differences between patients discharged alive from the index and those who die during the index hospitalization (Heckman, 1979).

There are two steps in the Heckman method: the first step is the development of a selection equation, the 30-day mortality equation which works as a selection mechanism. This step includes derivation of a variable from the selection equation called the Inverse Mills Ratio (IMR). The second step of the Heckman method is the insertion of the IMR variable into the linear model for log-costs to control for selection bias, since the survival after AMI is hypothesized to influence the amount of resources to be spent or not (Heckman, 1979).

Marginal effects of the quality and DRG-based expenditures equations for each hospital were then compared to the overall sample rates to obtain the observed to expected ratios (OERs). Correlation between the cost and outcome OERs was then analyzed to test for relationship between the 30-day adjusted mortality and the DRG-based expenditures at 30 days after the index admission.

Finally, we focused on some specific treatments in AMI care (Coronary Artery Bypass surgery, Drug Eluting System-stents, post-AMI rehabilitation) in the 30 days after the index admission in order to provide figures about the variation in treatment intensity among Tuscan hospitals.
1.3. Results

1.3.1 Descriptive statistics

We identified 6,845 Tuscan patients who were hospitalized for an AMI in the year 2012. As shown in Table I, most of Tuscan patients are male, hospitalized for NSTEMI infarction. They present a lot of comorbidities, but with high degree of variation, as indicated by the standard deviations.

<table>
<thead>
<tr>
<th>Table I Sample Characteristics</th>
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<tbody>
<tr>
<td>No. of cases in the sample</td>
</tr>
<tr>
<td><strong>Patients outcomes</strong></td>
</tr>
<tr>
<td>Index mortality</td>
</tr>
<tr>
<td>30 days mortality</td>
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<tr>
<td>1 year mortality</td>
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<tr>
<td><strong>Patients characteristics</strong></td>
</tr>
<tr>
<td>Males</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>NSTEMI</td>
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<tr>
<td>Previous AMI</td>
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<tr>
<td>Heart Failure</td>
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<tr>
<td>Arrhythmia</td>
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<tr>
<td>Cancers diseases</td>
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<tr>
<td>Hematological diseases</td>
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<tr>
<td>Cerebrovascular diseases</td>
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<tr>
<td>Vascular diseases</td>
</tr>
<tr>
<td><strong>Treatments</strong></td>
</tr>
<tr>
<td>Previous Coronary Artery Bypass surgery (CABG)</td>
</tr>
<tr>
<td>Previous Percutaneous Coronary Intervention (PCI)</td>
</tr>
<tr>
<td>Previous Percutaneous Coronary Intervention (PCI) Index</td>
</tr>
<tr>
<td>Coronary Artery Bypass surgery (CABG) Index</td>
</tr>
<tr>
<td><strong>DRG tariffs</strong></td>
</tr>
<tr>
<td>DRG-based expenditures at 30 days year after the index hospitalization</td>
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<tr>
<td>DRG-based expenditures at 1 year after the index hospitalization</td>
</tr>
</tbody>
</table>

The variation is present also considering the outcomes and the DRG tariffs. The variation in outcomes and DRG tariffs are illustrated respectively in Figures 1 and 2 (mortality at 30 days and DRG-based expenditures at 30 days year after the index hospitalization).
Figure 1: Variation at hospital levels of the mortality 30 days after the index hospitalization.

Figure 2: Variation at hospital levels of the DRG based expenditures 30 days after the index admission.
1.3.2 Observed to expected ratios for outcome and DRG based expenditures

Marginal effects of the quality and DRG-based expenditures equations for each hospital were compared to the overall sample rates to obtain the observed to expected ratios (OERs). As illustrated in the Figure 3 and 4, for both outcomes and DRG expenditures there are no significant differences compared to the regional mean, but variation among hospitals persist even after having considered patients characteristics.

Figure 3: OERs for 30 days mortality among Tuscan hospitals
1.3.3 Relationship between outcomes and inpatient DRG-based expenditures

There is no correlation between the 30-day adjusted mortality and the DRG-based expenditures at 30 days after the index admission (Figure 5).
This lack of association is no surprising, because of the mean good outcomes of Tuscany region. Of course, the use of administrative can partially compromise the analyses, because of their lack of accuracy in coding all patients co-diagnoses compared to clinical data and in the coding of the DRGs tariffs, which are not used as real sources of reimbursement by the Tuscan hospitals, which are mainly financed on capitation based system. Anyway, also other studies (Jha et al, 2009; Hakkinen et al, 2014) suggest a lack of association between outcomes and costs for AMI care. This should make physicians think more about how they provide treatments and use of resources, suggesting, as illustrated in the next paragraphs, deeper analyses on the appropriateness and cost-effectiveness of specific high-costly interventions.

1.3.4 Focus on specific treatments

Precisely because there is no association in outcomes and expenditures, the high variation in providing treatments and services for AMI care among Tuscan hospital suggest rooms for improvement for both outcomes and allocation of resources. In
particular, considering the data analyzed in this study, Tuscan cardiologists should focus their attention on the appropriateness and cost-effectiveness of:

- the provision of Coronary Artery Bypass surgery (CABG). Compared to percutaneous coronary intervention (PCI), the CABG is considered the standard of care for patients with complex lesions, whilst for patients with less complex disease, PCI is an acceptable alternative (Mohr et al., 2013). Among Tuscan hospitals there are cases in which the CABG is provided 3 times more than the average regional values. When differences are so high, they cannot be totally explained by differences in patients needs and characteristics, but they might rely on physicians choices and practices (Nuti and Seghieri, 2014). This is particularly true considering the disease-specific characteristic of the AMI: hospital admission for AMI is a well-defined index event (Likosky et al, 2013) not related to the patients’ choice of providers. Furthermore, the AMI care is organized through integrated networks aimed at providing prompt interventions in all the Tuscan territory (even if there are some area, such as the islands, which distance from the network can be critical). For these reasons, patients with the same characteristics should be provided with the same answers in terms of treatments. Therefore, the variation in the provision of CABG might be related to overuse, underuse or misuse$^3$ issues of care. To tackle this potential issue, as suggested also in clinical guidelines, all patients with complex multivessel coronary artery disease should be reviewed and discussed by both a cardiac surgeon and interventional cardiologist to reach consensus on optimum treatment. Further, shared regional guidelines should be promoted by the cardiologists in order to uniform practices.

- the provision of Drug Eluting System Stents (DES) versus the provision of Bare Metal Stents (BMS). In the first years of their development, the DES have had a rapid diffusion, especially in the US, substituting in about 70% of the cases the other stent devices (Greenhalgh et al, 2010). However, further studies and cost-effectiveness concerns regarding their higher costs, suggested both at international (Greenhalgh et al., 2010) and regional level (Commissione Regionale Dispositivi Medici dell’ Emilia Romagna, 2011) a more appropriate use for specific categories of patients. Indeed, also in the Italian context, Emilia Romagna region had started in 2002 an in-depth analysis of the provision of DES, in order to assess them both in terms of

$^3$“Misuse occurs when an effective treatment or procedure was selected but was then performed poorly so the patient failed to receive its full potential benefit. Overuse refers to the provision of a health service when its risks exceed its benefits...underuse is the failure to provide a health service in circumstances where it would have provided a net benefit.” (Dunham et al.,1994)
appropriateness and cost-effectiveness. The results suggested to develop shared regional guidelines to define whether provide those treatments and to which patients. Considering the regional indications, in Emilia Romagna the percentage of DES on all the stents provided is about 40% (Commissione Regionale Dispositivi Medici dell’Emilia Romagna, 2011). In Tuscany, this percentage is much higher (about 77%). In both Emilia Romagna and Tuscany regions there is variation in the provision of the DES among hospitals and Local Health Authorities, but in Tuscany the variation seems higher and shared regional guidelines should be developed to define the most appropriate use. We do think that the provision of this treatment should be further discussed by the Tuscan cardiologist to improve sharing of practices and increase resources accountability, considering also the difference in cost (more than 1,000 euros for each stent) compared to BMS (Commissione Regionale Dispositivi Medici dell’Emilia Romagna, 2011).

- the provision of post-AMI rehabilitation services. Cardiac rehabilitation may represent an opportunity to provide effective healthcare and achieve a high quality of life for older patients (Dobson et al, 2012). However, not all the patients experiencing an AMI are provided (or should be provided) with cardiac rehabilitation. Also in Tuscany region, there is great variation in the provision of these services by the Tuscan hospitals (there are hospitals in which a quarter of the patients experience rehabilitation and other in which less than 5% does).

1.4. Discussion

There is no association between outcomes and expenditures for AMI care among Tuscan hospitals. However, the differences in the treatments provided to patients required additional investigations, since they are not completely related to patients’ needs, but probably to different physicians’ choices and practices. In particular, cardiologists and physicians of Tuscany need to focus the provision of CABG, DES and rehabilitation services, in order to assess their appropriateness and possible overuse, underuse or misuse of resources. As already developed by the Emilia Romagna region, in-depth analyses on the cost-effectiveness of treatments should be implemented in collaboration with the professionals in order to settle regional shared guidelines with population-based approaches (Commissione Regionale Dispositivi Medici dell’Emilia Romagna, 2011). We believe that the meetings and the discussions on the administrative data with the group of Tuscan cardiologists represent a good
starting point for further investigations and sharing of practices. In particular, the AMI care pathway represents an interesting case to be analyzed with physicians, because it required to be organized with an integrated network approach in order to promptly and successfully address patients’ urgency at the index-admission (Krumholz et al., 2006; Kalla et al., 2006). Indeed, the appropriate care for a patient with infarction cannot be provided by a single hospital, but it is the result of an integrated system (ambulances, Emergency Departments, hospitals and specialized centers with cath-lab). Hence, the comparison of data and practices among physicians to investigate variation and the relationship between outcomes and expenditure is essential to identify consistent strategies of improvement to ensure appropriateness of treatments and efficiency in the use of resources. This paper thus contributes to make the physicians and policy makers aware of the impact of their choices on the system use of resources through analyses of results based on administrative data through a population-based approach (Gray, 2013). Indeed, the use of administrative data in the analyses help professionals in gaining a population-based approach and can be useful to address some of the usual limitations of comparative effectiveness research (Chung et al., 2014):
- the lack of comparison of whole health systems, since the comparison are often made by using voluntary registries, one-off surveys or trials. Clinical data are often not available for all the population of interest, thus making the comparison partial. In our study we analyzed the outcomes and the characteristics of the whole patients population of the Tuscany regions by using administrative data of hospitalizations for the period 2012-13.
- the comparison of only care or outcomes measures or focus only on patients with either ST-segment elevation myocardial infarction (STEMI) or non-STEMI (NSTEMI). Indeed, registry data on AMI have usually enrolled patients with STEMI, whereas data from patients NSTEMI are analyzed separately with unstable angina patients (Goldberg et al. 2004). On the contrary, even if the STEMI infarction is usually considered a more serious condition because of it develops a complete occlusion of a major coronary artery, both types of AMI need prompt medical treatment. For this reason, in our analyses we include both outcomes and DRG-based expenditures of care for STEMI and non-STEMI patients.
However, the use of administrative present some limitations too. Indeed, administrative data, even when elaborated statistical models and risk-adjustment techniques are adopted, are often not able to explain all the differences and elements of patients outcomes and conditions, compared to data from clinical registries (Berta
et al, 2013), because of their less accurateness in recording diagnoses (Iezzoni L, 1997). Nevertheless, the use of administrative data is growing by healthcare agencies and other stakeholders to measure hospital quality and create reports to rank institutions or providers (Goldman et al., 2003). In this sense, greater accuracy in their coding by making the physicians aware of their importance is needed. Administrative data should be seen not just as an administrative and bureaucratic fulfillment but as an useful instrument to gain a better understanding of the populations’ characteristics and outcomes. Indeed, administrative data are easily accessible, relatively inexpensive to use, and allow for the collection of information on the entire population of concern (Austin et al, 2006). In this sense, the paper contributes to the engagement of physicians in the analyses of administrative data in order to gain a population-based perspective. To make the routine use of administrative data effective in this sense, physicians should have the chance to meet and discuss the data, compare results both with population-based approaches and with specific audits on individual patients. This would “facilitate the development and dissemination of a database for best practice and improvement based on the results for primary and secondary research” (Lilford et al, 2004) and improve the quality of the administrative data and their coding.

1.5. Conclusion

Right when there is no association between outcomes and expenditures, as in the case described for AMI care in Tuscany region, the use of the resources and the treatments provided have to be analyzed by the physicians in order to make them engaged in the identification of consistent improvement strategies considering also opportunities or resources reallocation (Nuti et al., 2010). To this purpose, the participation of physicians in meeting aimed at identifying and sharing best practice and uniforming behaviors at regional level should be enhanced. Furthermore, the quality of administrative data should be improved in order to support the engagement of physicians, in comparing outcomes, treatments and expenditures. This comparison is the basis to identify and share best practices, gain a population based approach and produce more value for money (Gray, 2013).

Acknowledgements

We would like to thank all the physicians involved, the regional and local representatives and all the researchers and colleagues (in particular Paolo Berta and
the researchers of the MeS-Lab and the Dartmouth Institute) for their valuable insights and collaboration. In particular we would like to thank Prof. Nuti for her comments and suggestions, which helped us to considerably improve the manuscript.

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2. Overuse or value for patients? Changing clinicians’ approach in the diabetic foot care pathway

Considering the levers of the framework by Lee and Cosgrove (2014) revised to be suitable for the Tuscan Healthcare System, the paper “Overuse or value for patients? Changing clinicians’ approach in the diabetic foot care pathway” provides examples of implementation of physicians’ engagement in quality improvement initiatives at local and regional levels.

In the following table (Table 6) a summary of how the levers have been used in the Tuscan experience described by the paper is provided.

Abstract

**Problem statement:** Despite overall good results of Tuscany Region in the Diabetic Foot (DF) care path, outcomes sharply varied among its Local Health Authorities. Since the implementation of an integrated care path have proved to be effective in improving outcomes, a project aimed at identifying and spreading organizational best practices, sharing improvement strategies and shifting clinicians’ approach towards integrated care was carried out.

**Case description:** A peer-review process based on qualitative and quantitative analyses was carried out involving professionals in mapping the care path organization among the different providers, benchmarking practices, processes and outcomes and analyzing patients’ stories along the entire care path. The project led to share improvement strategies at both regional and local levels.

**Conclusion and discussion:** In order to improve outcomes, professionals should not only focus on the clinical phase they are in charge of, but they should overcome organizational boundaries and feel responsible for the entire care path. Indeed, they should not only care for the patients they directly see, but also be accountable for the outcomes of the population they serve. In order to enhance integration among all the providers they should be involved in the decision-making process regarding policy development and resource allocation.

**Keywords:** Diabetic Foot, Benchmarking, Best Practice, Population Medicine, Engagement, Reallocation
Table 6: How to apply the motivational levers by Lee and Cosgrove (2014) in quality improvement initiatives at local and regional levels: the case of the Diabetic Foot pathway.

<table>
<thead>
<tr>
<th>Motivation for physicians</th>
<th>How to apply it</th>
<th>Implementation in the Tuscan context</th>
</tr>
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| To engage in a noble shared purpose | - Commitment of both regional and local organizational boards and managers to listen and support physicians in driving the improvement;  
- Focus on patients stories, highlighting the need of more integrated care;  
- Stimulate physicians’ clinical interest by looking at interventions impacting on severe diseases (both acute and chronic diseases). | - Focus on diabetes-related amputations at lower limbs: despite overall good results of Tuscany Region, outcomes sharply varied among its LHAs, thus suggesting unwarranted variation and equity issues.  
- By analyzing the patients’ clinical histories, researchers and professionals shared whether or not each patient received expected and appropriate care. The audit process showed how enhancing coordination among providers in a population-based perspective was a necessary action even in the case of outstanding average results.  
- The Tuscany Regional Administration was interested in coping with the variation in the Diabetic Foot (DF) pathway because of its clinical and managerial importance. |
| To satisfy self-interest | Not only financial incentives, but (mostly) intrinsic incentives:  
- Professional reputation through comparisons;  
- Participation in the construction of consistent indicators, able to represent patients’ conditions and orient clinical choices;  
- Learning by opinion leaders/best performers and training initiatives focused on the spread of best practices. | - No financial incentives were used, but physicians compared and shared practices, focused on individual patients’ stories among different providers and discussed with the researchers further analyses and indicators to gain a better understanding of clinical and organizational performances. Best and worst performers worked together to improve overall system outcomes. Training initiatives were proposed to spread of best practices both among diabetologists and vascular surgeons. |
| To earn respect | - Development of “communities of practices” (or “famiglie professionali”) both at local and regional level to foster new approaches to problem-solving and improvement, help to drive strategy and transfer best practices. These communities have to be sustained by facilitators (as researchers) to orient the discussion and support the understanding of performance measurement data. | - Peer-review process based on qualitative and quantitative analyses was carried out involving professionals in mapping the care path organization among the different providers, in benchmarking practices, processes and outcomes and analyzing patients’ stories along the entire care path. The visits made by the researchers aimed at creating a trusting environment for the professionals, lowering their barriers to openly discuss their practices. After the visits, meetings were conducted on a regular basis between the researchers, managers and clinicians. |
To embrace tradition

- The “communities of practices” (or “famiglie professionali”) might create the standards and traditions of the system and organizations to develop a common sense of identity. These standards (such as guidelines, shared priorities and design of care paths) translate into well-coordinated care, making physicians proud and enhancing their sense of identity with the regional healthcare system, which has been able to promote and sustain their engagement and the performance improvements.

- A proposal to re-design the DF pathway in Tuscany towards more integrated-care was sent to the Regional Commission for Diabetes. The document was based on the results of the mapping phase and on the discussions of the quantitative analyses and it was particularly inspired by the two case studies presented in this paper. The act was approved by the Regional Health Council on July 2, 2013, aiming at updating the previous Regional Administration Act n.1304 of 9/12/2003 on the organization of the DF care pathway.

- After the project, the physicians decide to keep meeting together with the researchers and analyze other diabetes-related cases (such as hypoglycemic events) and to engage other professionals in focus-specific analyzes (such as the involvement of cardiologists and vascular surgeons in the analyses for lower-limbs revascularizations).

2.1. Introduction and Background

Performance Evaluation Systems (PES) in the healthcare sector should be used to outline underperforming areas and drive improvement and possible resource reallocation [1-4].

Since 2004, the Tuscany Regional Administration has entrusted the “Management and Health Laboratory” (MeS-Lab) of the public university Scuola Superiore Sant’Anna to design and implement a multi-dimensional PES [5-6]. Tuscany is a region with approximately 3.7 million inhabitants in the center of Italy. Its Regional Healthcare System follows the Beveridge model providing universal coverage with an annual public healthcare budget of 6.6 billion Euros.

To support Tuscany policy-makers in the governance of the healthcare system, the PES is based on 130 indicators divided into 6 dimensions of analysis: population health status, ability to pursue regional strategies, clinical evaluation, patient satisfaction, staff satisfaction, and efficiency and financial performance. The indicators are calculated in benchmarking among the 12 Local Health Authorities (LHAs) which are responsible for the healthcare delivery of about 300,000 inhabitants and the 3 University Teaching Hospitals4. The results are linked to the CEO reward

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4Teaching Hospitals are reference centers for complex care and they are independent from LHAs. Their management is shared by academic physicians from the Universities of Florence, Pisa and Siena and by hospital physicians. Teaching Hospitals are, of course, part of the public
system of all these Health Authorities and publicly reported on www.performance.sssup.it.

The comparison of the Health Authorities with a benchmarking approach identifies areas for improvement and guides consistent strategies in the regional healthcare system.

Despite Tuscany’s overall good results on Diabetic Foot (DF) outcomes in comparison with the other Italian regions [7] (Figure 1), in 2012 the PES indicator Diabetes-Related Major Amputation at lower limbs (DRMA) rate (see Supplementary File N.1 for its calculation) sharply varied among Tuscany’s LHAs (Figure 2). Moreover, these differences were also persistent over time considering PES results in the previous years [8]. Indeed, this variation was not entirely due to different population needs because the prevalence of diabetes was almost uniformly widespread in the region and it was persistent even after age and gender standardization [7, 9].

Variation was also present in the financial perspective: the estimated expenditure (calculated with the Diagnosis-Related Groups - DRG) per 100,000 residents for DRMA hospitalizations ranged among LHAs from € 13,638 to € 105,087 (average of the four-year period 2009-2012).

These outcome and expenditure variations showed room for reducing potential overuse of resources for patients with avoidable poor outcomes, and for reallocating resources towards services with higher value for patients.

This paper presents a project based on Tuscany’s PES data regarding the integration in diabetic foot pathway where a peer-review methodology among professionals was applied to improve performance on a population basis and identify room for resource reallocation.

The Tuscany Regional Administration selected the Diabetic Foot pathway because of its clinical and managerial importance regarding:

- the peculiar etiology and the increasing prevalence and incidence of DF complications, which represent the first cause of lower-limb amputations in industrialized countries. The World Health Organization estimates that up to 85% of them could be avoided [10-11];

healthcare network along with the LHAs. Outcomes and performances are also linked to this collaboration. Hence, in those areas where a Teaching Hospital provides hospital care for the LHA, the Regional Administration sets common targets for the PES indicators for both LHA and Teaching Hospital, in order to foster a shared responsibility towards the population they serve.
the relevant and increasing social and financial costs related to the severe health status of DF patients, particularly in the case of surgical intervention: DF care is associated with high additional costs for both patients and healthcare systems [12-13]; the several providers and professionals that should be involved in DF care in an integrated care network. The introduction of a multi-disciplinary foot care team and the implementation of an integrated care path with other services have proved to be effective in reducing amputations [11, 14-17].

Figure 1 – Age and gender adjusted hospitalization rates for diabetes-related amputations (major and minor) at lower limbs per 100,000 residents in the Italian Regions - Year 2012.

Source: National Agency for Regional Health Services [7]

This paper contributes to the current debate on how to spread integrated care [18-19] and how to engage professionals, which is essential to drive improvement strategies [20-22], changing clinicians’ behaviors and practices towards a population-based approach [23-24].

With this goal, the paper presents the DF project and two related case stories and focuses on the methodology developed to:
i) foster the analysis of data with a benchmarking approach to avoid an inward-looking perspective and support a constructive and shared comparison of data at the regional level;

ii) engage the professionals of the entire care path in a systemic and periodical peer-review process of data analysis aimed at promoting a shared improvement strategy;

iii) shift professionals’ attitudes towards “population medicine”. In a Beveridge healthcare system pursuing universal coverage, clinicians should 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” [24, p.200], as “public health professionals”. Consequently, they should participate in the decision-making process regarding resource allocation throughout all the providers that are involved in the integrated clinical path.

Figure 2 - Diabetes-related major amputation at lower limbs rate per million residents – Tuscany PES results 2012.

Source: MeS-Lab

This paper presents the main results of the project and explains the commitment achieved during the engagement process by illustrating two case studies: Arezzo and Pisa LHAs, the best and worst performers in terms of PES DRMA indicator. These two cases were chosen because they illustrate how professionals were engaged in the
project and how they developed consistent improvement strategies towards population medicine and integrated care. Finally, some preliminary results on the overall impact of the project at the regional level are illustrated.

2.2. The project methods and findings

The DF project methodology was based on the engagement of professionals in all the Tuscany’s Health Authorities in a systemic and periodical peer-reviewed comparison of practices and population-based data in benchmarking to identify the determinants of the different results achieved by the Health Authorities, the room for enhancing integration among services and providers and the possible overuse of resources. Therefore, on the basis of action research and positive deviance principles [25-26], the engagement process was designed in order to identify and spread local best practices and to disseminate consistent actions for improvements at both the regional and local levels. The project began in July 2012 and it was carried out in three phases in the last 2 years.

Phase I “The mapping phase and the involvement of professionals”

The researchers firstly involved the team leaders of the 12 LHAs and the 3 Teaching Hospitals Diabetic Foot Outpatient Clinics because of their central role in coordinating all the professionals in the DF pathway (from community to hospital care), and visited their organizations.

Together with a representative of the Regional Commission for Diabetes, the MeS-Lab researchers designed a questionnaire to guide the mapping phase in each Health Authority. This tool analyzed eight areas of the care path where integration is particularly necessary: screening, admissions and visits, revascularization procedures, surgery, urgent path, follow-up and continuity of care, patients and caregivers education, training of professionals and information systems. The visits were aimed at creating a trusting environment for the professionals, lowering their barriers to openly discuss their practices.

5The Regional Commission for Diabetes is one of the Commissions of the Regional Health Council, a technical consulting body for the Regional Administration. The Regional Commission for Diabetes is made up of professionals and technicians working in the regional healthcare system specialized in diabetes care.
Phase II “Set-up of the Project Team”

After the visits, the first plenary meeting was arranged with the professionals and their teams, the managers of the Health Departments of each Health Authority and the representatives of the Regional Administration, General Practitioners and diabetic patients association, for a total of 47 people. The results of the mapping phase were presented in a benchmarking perspective at the Health Authority level in order to identify and share organizational best practices.

Phase III “Pathway analysis and periodical peer-review”

Meetings were conducted on a regular basis between the researchers, managers and clinicians. During the plenary meetings, the Project Team discussed patient pathways on the basis of the quantitative analyses of the administrative data flows. The data collection and analysis method were open and flexible and based on an interpretative process aimed at highlighting criticalities and best performers and at formulating improvement strategies [25-26]. The researchers often modified, updated and added quantitative analyses on the basis of the professionals’ requests and suggestions.

The analyses were performed at both the patient and the Health Authority levels:
- the patient level analyses focused on a cohort of 190 diabetic Tuscany residents amputated in 2011. The database was created with a record linkage of administrative flows between 2009 and 2012 on hospitalizations, outpatient visits, diagnostic tests, and drug consumption. Each patient’s clinical history considered the period ranging from one year before to one year after the 2011 hospitalization for DRMA;
- the Health Authority level analyses provided quantitative measurements of the services delivered by each LHA for its population considering both service volumes and estimated expenditures. These analyses were collected with a benchmarking and population-based perspective in order to check if and what services were delivered and the impact on Health Authorities’ budgets. These analyses allowed the professionals to discuss also possible resource reallocation [23].

Project Findings

- By analyzing the 190 amputated DF clinical histories, researchers and professionals shared whether or not each patient received expected and appropriate care. For example, 2 out of 190 diabetic patients amputated in 2011 did not receive any outpatient visits and they were not hospitalized within a year before their amputation.
These numbers may not seem sufficiently high to raise concerns about Tuscany’s overall good results. Nevertheless, the presence of just one patient completely unknown until an amputation highlights that the organization of the care path shows room for enhancing integration in order to provide the appropriate care. Indeed, these cases showed that there were problems between Primary Care and Diabetic Foot Outpatient Clinics in promoting prevention and managing the entire care path.

The audit process carried out by the Project Team for these 190 patients showed how enhancing coordination among providers in a population-based perspective was a necessary action even in the case of outstanding average results.

- The population-based perspective allowed professionals to discuss how the services provided in the DF pathway actually impacted on LHAs’ resources. Researchers calculated the LHA estimated expenditure (calculated with the DRGs) of the hospitalizations for diabetes-related revascularizations at lower limbs, considering the average of the four-year period between 2009 and 2012. Expenditure for DRMAs was collected with the same criteria. In order to compare the impact of these two items on the LHA budgets, the estimated expenditures were then re-proportioned per 100,000 residents (Figure 3) (see the Table in Supplementary File N.2). In this perspective, the DRMA hospitalization expenditure could be considered an opportunity cost for delivering other services (such as revascularizations) for the prevention of these surgical interventions.
As illustrated in Figure 3, LHA expenditures sharply varied considering the overall values and the cost-mix of the two items. The variation in the cost-mix showed room for the potential reallocation of resources towards preventative interventions, such as revascularizations. Hence, this population-based approach helped professionals shift their accountability from the costs of the productive factors they directly managed in their ward (personnel costs, facilities depreciation charge, etc.) to the impact of the overall expenditures of the DF patients on their own LHA global budgets. Indeed, during these meetings, clinicians became aware that the overall healthcare expenditure for the 190 DF cohort patients was approximately 6 million Euros (considering hospitalizations, outpatient visits, diagnostic and laboratory tests and drug consumption delivered during the period within one year before and one year after the DRMA of each patient).
- Regarding miscoordination with Primary Care, participants discussed the evidence of a patient survey conducted by the MeS-Lab to assess the perceived quality of the Chronic Care Model (CCM) in Tuscany’s LHAs. In particular, patients declared that the foot check-ups during Primary Care visits were the weakest point in the diabetic care provided by General Practitioners and their staff. In fact, foot control showed a lower compliance with respect to other diabetes check-ups (weight, glycaemia, etc.). Moreover, they were not uniformly performed in the Region (Figure 4) [9] (the complete survey method is available in the Supplementary File N.3).

**Case studies**

The following case studies provide useful details and elements about the improvement process carried out during the project towards integrated care.

**Arezzo: holding the best performer position**

Arezzo is a Tuscan province and its Local Health Authority has about 340,000 residents. In each of its five districts (Aretina, Casentino, Valdarno, Val Tiberina, Val di Chiana Aretina) there is a hospital but the Arezzo-LHA referral center for Diabetic Foot care is the San Donato Hospital in the town of Arezzo.
Arezzo-LHA is the best national performer in terms of diabetes-related amputation rate, with also the lowest value in the Tuscany’s Performance Evaluation System indicator for DRMA since 2008 [7, 8].

The mapping phase in Arezzo-LHA Diabetic Foot Outpatient Clinic (DFOC) showed that the most important elements of these good results were the care path integration with the other professionals and the coordination of all the Diabetic Foot services with a population-based approach.

In fact, the head of the DFOC in San Donato Hospital did not directly control resources, such as hospital beds, but she was in charge of coordinating DF care for the overall Arezzo-LHA’s population. Her focus was to improve the patient care path by looking for the specific competences and resources that the patients needed, regardless of organizational boundaries such as settings and hospital departments (e.g. primary care setting, outpatient care, slots in cath-lab and in surgical rooms, beds in other departments, etc.).

To achieve this, the DFOC team defined clear steps for providing services to DF patients in collaboration with the professionals in the other wards and settings. The daily contacts between these professionals led to weekly scheduling of diagnostic tests and revascularizations, ensuring fast-track pathways in case of urgency. Thanks to the DFOC head’s efforts to enhance communication between wards, all the professionals became fully aware of the issue and started to directly and promptly care for DF patients. In this way, they minimized potential bottlenecks in patient flow, such as the need for a formal involvement of the diabetologist or for the scheduling of treatments and exams through a centralized office. Furthermore, the increased communication and collaboration between wards enhanced the hospital’s commitment to promptly inform the DFOC team in case of inpatient DF complications. For example, the cardiology department provided equipment for the DFOC team so that they could directly care for hospitalized DF patients, regardless of the organizational boundaries.

In addition, the DFOC information system was completely integrated with the ones implemented in other wards. Finally, the DFOC clinical staff directly performed minor surgical interventions so that there was no need to involve surgeons, thus reducing potential bottlenecks in the surgical phase.

Furthermore, integration with healthcare services outside San Donato hospital was pursued. General Practitioners had clear and identified pathways for DF patients, for both DFOC activities and other diagnostic exams. Indeed, General Practitioners could interact in case of DF complications with hospital services through simple slot
scheduling schemes. In addition, the DFOC team participated in all the training initiatives organized with the Primary Care level in order to enhance coordination and awareness of DF problems.

This collaborative climate helped coordinate all the services provided to the Arezzo LHA’s population and not just with a provider, inward-looking perspective.

In fact, the head of the Arezzo-LHA DFOC was fully aware of the number of DRMAs and revascularizations of Arezzo-LHA patients, rather than just conscious of the figures of San Donato Hospital.

During the visit of the MeS-Lab researchers, she indeed stated:

“Your data are always consistent with mine.”

One of the key points discussed during the plenary meetings with the Project Team was the Arezzo-LHA’s focus on promptly delivering revascularizations, which are highly important treatments in preventing amputations.

As expected and illustrated in the data collected by the MeS-Lab researchers (Figure 3), Arezzo-LHA showed a cost-mix sharply oriented towards revascularizations and, interestingly, it did not account for one of the lower overall costs. Professionals could then discuss not only the “traditional” topic of pure savings, but a more pertinent topic to their daily practice: the potential reallocation towards services with great value for money (e.g. revascularizations instead of amputations) that could be achieved by enhancing coordination among providers, moving from an individual provider-centered to a population-based, patient-centered, perspective.

In conclusion, the Arezzo-LHA experience seemed strongly connected with the clinicians’ personal commitment to organizing a multi-disciplinary and prompt DF pathway, by not “locking themselves into the DFOC walls”, and to engaging the other professionals in the same commitment. This engagement was achieved thanks to the clinical reputation of the DFOC team, enhanced, as stated by the DFOC head, by:

“The periodical publication of our good outcomes in the Tuscany’s PES, which has encouraged and fostered our work.”

This population-based, patient-centered approach seemed to be the key element of Arezzo-LHA performances, rather than the search for direct control over resources related to organizational benefits for the DFOC head’s department.

Of course, an important role was also played by the other professionals who collaborated with a multi-disciplinary pathway method and by the Chief Medical
Officer who supported the DFOC approach in case of conflicts with other professionals.

**PISA: how the worst performer can turn the situation around**

Pisa is a province of Tuscany and its Local Health Authority has almost the same population of Arezzo LHA (340,000 residents).

Hospital care in Pisa town is delivered by the Teaching Hospital of Pisa (THP) and not directly by the Local Health Authority. Therefore, unlike the hospital network organization in Arezzo, the Local Health Authority of Pisa has a more complex framework in the coordination of hospital, community and Primary Care services.

The THP provides complex care (such as transplants, neurosurgery) for Pisa-LHA and for the other LHAs in the north of Tuscany. Nevertheless, more than 50% of Tuscany patients admitted in the THP are residents in the province of Pisa.

THP is also the Regional Referral Centre for Diabetes and it is the only hospital in the Region of Tuscany with a specific ward managed by diabetologists.

Considering the presence of this regional referral center, the results of the Local Health Authority in the DRMA indicator were expected to be good. On the contrary, during the three-year period from 2010 to 2012 Pisa-LHA DRMA rates were definitely among the highest regional values.

During the visit, the Head of the DFOC in the THP stated:

*"We perform more amputations because we are the regional referral center and we serve a larger area than Pisa-LHA."*

Hence, the DFOC of the THP considered the amputations delivered to diabetic patients only if previously cared by its staff and regardless of LHA residency.

As the Regional Referral Centre for Diabetes, THP provided care for patients from all over the Tuscany Region: indeed, 60.5% of the DRMAs performed by THP in 2012 were delivered for patients who were not residents of Pisa LHA.

This, of course, increased the incentive for the teaching hospital to follow a provider perspective rather than fostering a shared responsibility between the THP and the LHA towards Pisa residents with a population-based approach.

Indeed, the team of the Teaching Hospital of Pisa raised concerns over external interaction with Pisa-LHA structures and professionals.
In particular, it seemed clear that the division between the independent THP 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 by the Pisa-LHA sharply increased the chances for miscoordination.

Indeed, the DFOC team stated that there were concerns over coordination with General Practitioners in the screening phase, as confirmed by the results of the survey conducted by MeS-Lab (Figure 4): Pisa-LHA patients reported the lowest percentage of adherence to this phase. The high value of the Pisa-LHA DRMA indicator could be partially explained by this issue.

During the project, the DFOC team participated in the debate and data interpretation with growing interest. The DFOC head felt that the discussions between professionals helped to understand the issues to be solved and fostered the commitment to tackle them. Indeed, he stated:

“Before this project, I was fully focused on doing the best along the pathway in my hospital for the patients that I was caring for. The population-based approach helped me to better understand how to tackle the high value of the Pisa indicator.”

The DFOC team began a constructive improvement process to deal with the miscoordination issues highlighted during the project in order to:

1. Foster coordination with the Local Health Authority of Pisa: the DFOC head asked MeS-Lab researchers more detailed information on the pathways of Pisa-LHA residents amputated in THP (length of stay, operation ward, discharge ward, age, gender, educational level, previous screening and revascularization, etc.). With these figures, he contacted the other professionals involved and carried out specific audits. The aim of these meetings was to understand the real pathway followed by each amputated patient and, in particular, those who had not been previously cared for by the DFOC team and were hospitalized for amputations through the emergency department. The results of these analyses were also presented and discussed by the Project Team during one of the plenary meetings. The audit process was enlarged outside the THP, establishing a strong collaboration with the Pisa-LHA in order to map all the patient pathways that were shared by both the institutions’ facilities.

2. Reduce the coordination gap with Primary Care. The head of the DFOC organized a training course for Pisa-LHA community nurses in charge of the primary screening phase. His personal initiative to move to the peripheral structures of the Pisa-LHA
confirmed the strong commitment to the population-based approach fostered by the project.

All these steps enhanced stronger collaboration and joint accountability of Pisa-LHA and THP for the DRMA results, overcoming their organizational boundaries. Moreover, the lack of coordination was also a problem inside the hospital. Indeed, the DFOC team considered only the amputations they directly performed or those performed by other THP professionals for patients previously cared in their outpatient clinic. Hence, the amputations which occurred in the THP without DFOC involvement were missed. In fact, 41 out of 86 DRMAs delivered by the THP in 2012 were not discharged by the diabetology department. Furthermore, the DFOC team also discovered that a high percentage of these DRMAs performed by other departments were not conservative. Indeed, in case of unavoidable amputation due to the severe health status of the patient, it is preferable to provide a conservative surgical approach (not through foot but above the ankle) because it allows patients to walk using special shoes. 74% of non-conservative DRMAs delivered by the THP during 2012 were indeed discharged by other surgical departments (n=32).

The lack of involvement of the diabetologists in the clinical path for these severe patients probably reduced the outcome results. This occurred because Teaching Hospitals are complex organizations in which all the different professions and disciplines coexist in both clinician-led and academic-led wards, multiplying the interaction between professionals and departments and thus increasing the chances of miscoordination and miscommunication. The mapping phase showed that THP pathways for DF patients, once cared by the DFOC, seemed well staffed, organized and clearly identifiable by the patients themselves. Indeed, the DFOC included a team of podiatrists with resources directly managed by the Diabetology Department (including some hospital beds). In addition, the DFOC team directly performed minor and conservative amputations, with some scheduled slots in both the surgical rooms and in the cath-lab for revascularizations. Nevertheless, in the complex organization of the THP, some patients left or did not start at all this path. This confirmed the need for greater integration among the several THP professionals and services and it raised concerns about equitable treatment for DF patients.
The results of the THP audit process were presented to the vascular surgeons and then a shared decision-process with the DFOC team was carried out to consider whether, when and at what level to perform the surgical interventions. The Pisa DRMA indicator sharply improved in 2013 compared to 2012: from 108.75 to 77.2 DRMA per million residents. This circa 30% improvement should be confirmed in the next few years and its significance will be tested. The case of Pisa represents an example of how the DF project has changed professionals’ behaviors towards integrated care with a population-based approach, focused on ensuring DF patients the same solutions to the same needs and overcoming organizational boundaries.

Preliminary evidence and improvement strategies at the regional level

The Tuscan DRMA rate per million residents registered a decrease of 7.9% in 2013 compared to 2012 (from a regional value of 51.74 to 47.66) and a reduction of 14% in the coefficient of variation among LHAs (from 0.5 to 0.43). This may be considered an effect of the increased collaboration and coordination between professionals achieved during the project. Further studies will test this hypothesis. A proposal to re-design the Diabetic Foot pathway in Tuscany towards more integration was sent to the Regional Commission for Diabetes. The document was based on the results of the mapping phase and on the discussions of the quantitative analyses and it was particularly inspired by the two case stories presented in this paper. The act was approved by the Regional Health Council on July 2, 2013, aiming at updating the previous Regional Administration Act n.1304 of 9/12/2003 on the organization of the DF care pathway. The act focuses on the following elements:

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

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

iii) the interdisciplinary collaboration among professionals involved in the pathway at the hospital level (radiologists, podologists, diabetologists, vascular surgeons, orthopaedic physicians, etc.);

iv) the training for diabetologists in basic surgical competences;
v) the clear and periodic communication, coordination and training initiatives between hospitals and primary care professionals in order to improve both preventative and follow-up care;

vi) the reinforcement of the network collaboration between professionals in the different Health Authorities (such as in the case of Pisa-LHA and THP).

2.3. Discussion

The Diabetic Foot project was successful in:

1. Fostering the analysis of results with a benchmarking approach.

The benchmarking process among providers, as proposed in the regional PES, is an effective tool in order to promote improvement strategies and to identify geographic variation if:

- the results in benchmarking are published. Documenting and publicly comparing healthcare performance [27-29] in benchmarking are necessary strategies that governments should include in their agenda;

- these comparisons are analysed in a trusting environment where professionals feel comfortable in openly discussing and comparing their organizational and clinical practices. “Naming and shaming” processes [30] alone cannot foster feasible improvement solutions [31-32].

2. Engaging all the professionals involved in the care path in a peer-review process of systematic data analysis.

As implemented in the project, a program that actually encourages clinicians to share the strengths and weaknesses of patients’ pathways and local organizations is necessary both to find shared solutions and to ensure their adoption [33]. Indeed, the project led to both the approval of a new regional act that redesigned the DF pathway towards integrated care and supported the implementation of internal audits in the organizations. Furthermore, the improvement of the Tuscany amputation rate in 2013 and the reduction of its variation are encouraging preliminary results of increased collaboration between professionals and an ongoing dissemination of best practices. Future studies will test whether this approach has led to a significant positive impact in improving performance and outcomes. The participation to the plenary meetings of
the representatives of General Practitioners and the sharing of the main data with the regional group of vascular surgeons started a broader collaboration aimed at carrying out further shared improvement initiatives. Moreover, the cohort analysis, the patient survey on foot control and the participation to the plenary meetings of representatives of the diabetic patient association should be complemented with a direct involvement of Diabetic Foot patients in the project.

3. Shifting professionals’ attitudes towards “population medicine”.

During the project, professionals learned more about how their choices affected the organization of the entire clinical path and drove the resources spent by the healthcare system. In addition, the analyses of the entire path of the patients helped professionals reflect on their role as “public health professionals” and not just diabetologists or professionals working in a specific department [23-24]. In this sense, professionals should focus not only on how to improve the DF pathway for the patients they directly care for in their own organization, but also on how to deliver services and allocate resources for the population they serve. In fact, each institution is a node of the integrated network and the care delivered creates value for patients only in this broader dimension. In this respect, the population-based analyses discussed during the project were particularly useful in highlighting room for reallocation of resources towards more value-for-money interventions for patients [2-3]. Moreover, further value-for-money analyses should include the social costs related to the Diabetic Foot path (caregivers and patient productivity costs, etc.).

2.4. Conclusion

Regional PES can be a relevant tool to drive the improvement process towards population medicine. This can be achieved if data is included in benchmarking, on a population basis, guaranteeing public disclosure.

Health professionals and managers can use these data to share consistent actions to improve outcomes, reduce geographic variation, identify room for reallocation and avoid the risk of overuse of resources through integrated care.

The approach allowed to discuss the determinants of the different results achieved by the Health Authorities and the potential overuse of resources in the Diabetic Foot Pathway in Tuscany. Professionals led a consistent improvement process at both the local and regional levels, overcoming professional and organizational boundaries.
In a Beveridge healthcare system, which pursues universal coverage and equity, the population-based approach should be encouraged. Indeed, professionals in this type of healthcare system should be engaged in a cultural change process where their work is less constrained in organizational boundaries and more oriented to the creation of overall value for patients in a population perspective, adopting a systemic and integrated approach in all the phases of the clinical path.

2.5. References


CHAPTER 4 Discussions and concluding comments

Because of the strong positive link between an organization’s clinical and financial performance and the degree to which physicians are engaged in maintaining and enhancing its performance, securing physician engagement at all levels is critical for health system reform and organizational performance (Clark, 2012; Reinertsen et al., 2007; Doctors of BC Policy, 2014; Spurgeon et al., 2011; Ham and Dickinson, 2008; Ham, 2009). Physicians’ high competences and specialization and their role of main decision-makers for therapeutic and treatment choices for patients not allow managers to directly control their professional activities. For these reasons, it is necessary to engage them in order to make them aware and accountable of the impact of their role. Indeed, there is a growing interest in the literature about the design and implementation of strategies and levers to initiate and support physician engagement, as the first step to enhance their responsibility, accountability and leadership to achieve system improvement (Reinertsen et al., 2007). However, the main experiences exploring these issues have been conducted in individual private organizations (Lee and Cosgrove, 2014). In public healthcare systems, in order to answer to populations’ needs with appropriate and equitable treatments, the engagement of physicians should be enhanced to facilitate their action, carried out with integrated and systemic approach. The revised framework by Lee and Cosgrove (2014), used in the papers analyzing the Tuscan cases, provides useful insights for each of its following motivational levers, according to the characteristics of the regional public healthcare system in which they were applied:

- **Engage in a noble shared purpose:** as stated by Mintzberg (2012) “Health care functions best as a calling, not a business; as such, it needs greater cooperation, not competition, among its many players and institutions. Physicians may be well paid, but these are smart people capable of earning large incomes elsewhere. What keeps many, if not most, of them in health care is the sense of service. [...] Resistance to collaboration in the professional organization will more likely be overcome by drawing on the professionals’ sense of calling, and enhancing their organization as a community of service”. The attention to the benefits provided to the overall population (as highlighted in paper 1 with the priority setting project) and the emphasis on population-based data, together with focus on individual patients stories (as
highlighted in paper 2 for the AMI care pathway and in paper 3 for the Diabetic Foot pathway) stimulate physicians’ clinical interest and enhance their commitment in improving care. In future studies it will be interesting to directly involve also patients, in order to provide physicians with more direct feedbacks and experiences and empower patients in the improvement of their diseases. In particular, in priority setting projects, contributions of patients, representatives of patients’ associations and caregivers have been already developed (Boivin et al, 2014), whilst, to date, patient involvement in quality improvement has been limited (Shortell et al, 1995). In the third paper (“Overuse or value for patients? Changing clinicians’ approach in the diabetic foot care pathway”) a representative of the Diabetic patients’ association has been involved and patients’ survey have been discussed among physicians. Nevertheless, further patients’ involvement is needed, since the direct involvement of patients might contribute to enhance physicians’ commitment in quality improvement initiatives, focusing on their purpose to improve patients’ care. Moreover, we found that sharing stories on individual patients catches the attention of physicians, but at the same time it is important to make them aware of the overall population outcomes and system expenditures. For this reason, quantitative analyses both on outcomes and expenditures are essential, because they provide to physicians valuable insights on the impact of their clinical and therapeutic choices and highlight potential equity issues. Sharing data and measurements with a benchmarking approach, as proved in this thesis, represent the basis of the engagement of physicians and of the consequent quality improvement strategies. A performance evaluation system, as the one developed in Tuscany, built on administrative data with a population-based approach, helps researchers and physicians to share and discuss performance data. Nevertheless, as indicated in the first paper (“Priority setting in healthcare: engaging decision-makers, managers and professionals at local level”), it is also important to make physicians comfortable in making assumptions and using their experience to make appropriate judgments in case of missing or partial data (Mintzberg, 2012). Indeed, administrative data, as highlighted in the second paper (“Measuring the relationship between outcomes and DRG tariffs in the treatment of Acute Myocardial Infarction: the case of Tuscan hospitals”), are less accurate in recording diagnoses than clinical data (Iezzoni L, 1997), but they can be used to enhance improvement strategies. In this sense, it is interesting to remember the selection and change pathways, discussed in in the first chapter (Berwick et al, 2003 and Flottorp et al, 2010). Both pathways are useful to improve performance and somehow the “selection pathway” seems a
prerequisite for the “change pathway”, thus providing data and identifying best practices. In the cases analyzed in this thesis we developed a “change pathway”, by enabling peer-review mechanisms and making physicians working together in “communities of practice” (Wenger et al., 2002) or “famiglie professionali”. The engagement of physicians in these groups was successful and more members and representatives should be included (even if higher numbers would make the facilitator roles of researchers more difficult).

- **To satisfy self-interest and to earn respect**: to engage physicians is important also to satisfy their self-interest and to focus on the strength of reputational pressure. For both levers, career development and professional training are essential instruments. For this purpose, it is interesting to notice that the involvement of physicians in managerial roles have not always had the desired impact on performances (Sartirana et al., 2014). This is related to the fact that physician engagement cannot be limited to initiatives located at the apex of the organization or system, since in healthcare organizations positions in managerial roles are usually not taking the day-to-day decisions impacting on performances. As stated by Clark and colleagues (2012): “most organizations saw “medical leadership” as the top 20 or so medical leaders in formal position, but true engagement means attaining a strengthened contribution from all, rather than a potentially isolated few”. Current conception of leadership suggest that it needs to be collective, shared, distributed and “plural” (Denis et al, 2012) and not a hierarchic one. Occasions to develop this kind of leadership are represented, in our cases, by the meetings of the “famiglie professionali” (Papers 2 and 3) and by the meetings of the stakeholders groups in the priority setting project (Paper 1). These meetings satisfied physicians need to interact with their peers and incentivized them to improve their practices by acquiring a systemic population-based perspective. Furthermore, careers developments pathways and specialized training based on peer review processes are needed in order to spread best practice and motivate physicians (Australian Commission on Safety and Quality in Health Care, 2010). Finally, although extrinsic incentives are not the main driver for physician involvement, physician investment in term of time and commitment in these peer review processes should be properly compensated (economically or with ECM credits).

- **To embrace tradition**: occasions to meet and work as communities of practices (“famiglie professionali”) should be organized and managed at regional level in order to constitute and spread a “Tuscan way of doing things” (inspired to the “Mayo way of doing things”, cited by Lee and Cosgrove, 2014). This Tuscan model, physician-led,
evidence-based and data-driven, should be based on the continuous improvement of performances and sharing of best-practice in a benchmarking and “positive deviance” approach (Bradley et al, 2009). The “Tuscan way of doing things” would be based on the socio-technical approaches principles, thus founding the technical elements on transparent population-based benchmarking and evidence-based medicine, whilst implementing the social aspects through discussions and sharing of population data and individual patient stories in the “famiglie professionali” groups. Reinforcing the “famiglie professionali” approach and strengthening their role in more formal governmental bodies (such as in the Health Council committees) would create a positive tradition in the Tuscan regional healthcare system, making the physicians proud and motivated in working for the improvement of the system. Furthermore, this would help in producing a major cultural shift to promote both system and individual responsibility for quality. Indeed, physicians are imbued with a deep sense of personal responsibility for the outcomes of their patients—their own patients—thus making for them difficult to share responsibility of choices, whilst they are not used to feel responsible for the overall population in the system. Feeling individually responsible, which is the primary driver of the physicians’ fierce attachment to individual autonomy (“If I’m personally responsible, then I must have complete control and autonomy in the decisions about care”) (Reinertsen et al 2007), stands in direct contrast to the central idea of quality improvement and the recognition that to provide better care is essential to work in coordination and integration with the other physicians and providers, with a network and systemic approach (Reinertsen et al 2007). To get physicians to see the system in which they work as part of their professional responsibility, leaders must use practices that encourage a systems view, and allow physicians to make a profound shift in mindset, framed as follows: “As a leader in this system of care, I share responsibility for the outcomes of all the patients in the system, regardless of whether I was personally involved in their care” (Reinertsen et al 2007).

Finally, as a transversal discussion issues, it is important to highlight the researchers’ contribution in all the engagement process and in the implementation of all the levers illustrated. Indeed, considering the first lever (“to engage in a shared noble purpose”), the researchers help in focusing the attention of physicians on individual significant patients’ stories, on the criticalities to be solved, but also on the best practices to value. This is possible thanks to the implementation of a research approach based on “action
research”, aimed to help the practitioners to understand their practices, identify problems and subsequently to develop strategies for improvement (Vallenga et al., 2009). Indeed, the strength of action research is its ability to influence practice positively while simultaneously gather data to share with a wider audience. Therefore, the success of action research should not be only judged in terms of the size of change achieved or the immediate implementation of solutions, but on what have been learnt from the experience of undertaking the work, since the solutions emerge from the process of undertaking the research (Meyer, 2000). In this sense, the papers illustrated in this thesis constitute a great learning experience for both the physicians and the researchers involved. Considering the second and third levers (“to satisfy self-interest” and “to earn respect”), researchers’ role is essential in facilitating the meetings of the “famiglie professionali” and of the stakeholder groups, orienting their discussion and improvement intents. Indeed, researchers support physicians in identifying the best practices, highlighting the possibilities of transferring knowledge through career and training developments. Finally, considering the last lever (“to embrace tradition”), researchers can organize the meeting of the “famiglie professionali”, supporting them as group learning sessions. Last, but not least, thanks to their involvement in the activities of the “famiglie professionali” researchers can provide contribute to the academic and research context in different field and pathways of care, offering useful insights and solutions that could be tested elsewhere, considering their different settings. Indeed, it is important to underline that there is no such thing as “physician engagement in general”, but both improvement and engagement take place at finely granular levels, with specific changes in processes and designs, in the case of improvement, and within individual physicians, in the case of engagement. For these reasons, the cases of AMI care and Diabetic foot pathways described in this thesis had different process of implementation and development, even if carried out in the same regional context. Nevertheless, studying and analyzing different cases help in gaining a better understating of the overall engagement process and the levers to be used, providing useful insights for their generalization and practical implementation.

In this sense, considering what was learnt thanks to the research conducted, the following points (briefly commented also by Bervicket al, 2003) need to be examined in depth:

1) **Invest in the time and change management required to alter core work process.** As highlighted both in the priority setting project (paper 1) and in the pathways implemented with the “famiglie professionali” for
both Acute Myocardial Infarction (AMI) and Diabetic Foot (DF) (paper 2 and 3), the engagement of physicians to make them leader of the required change need time. Local health authorities and local providers should promote physicians to work in groups and to have time to discuss and share practices. At regional, level, as already highlighted, these groups should be formalized and they should support the regional Health Council activities in defining the priorities of action to be inserted in the regional health plan and to implement guidelines and shared practices. The incoming new organization of the Tuscan regional health system (with the aggregation of the 12 Local Health Authorities in 3 great LHAs) might benefit of the improved collaboration and integration arising from the physicians work in the “famiglie professionali”. Of course, benchmarking of performances still remains at the basis of this improvement and engagement process and should be enhanced by opening the comparisons to other regional healthcare systems. The comparison with other healthcare system and the benchmarking of the “Network of Regions” promoted by the MeS-Lab provide useful elements to be further discuss at internal regional level.

2) **Use of a reliable flow of information.** There is the need of further investments to enhance the use and the quality of administrative data, in order to provide physicians with feedback on providers’ performances and populations’ health status. Indeed, a large part of the lag in quality improvement among physicians seems to be that they lack essential data and feedbacks by their own practices (Audet et al, 2005). At the same time data should be used to “generate light, not heat” (Reinertsen et al 2007). In this sense, much energy is wasted on arguments about “the data aren’t right, aren’t properly adjusted, aren’t relevant to MY patients outcomes, etc” (Reinertsen et al 2007). This energy should be directed instead on the use of the data for learning and not for judgments, recognizing the limits of administrative data but being able to go beyond those limits trying to focus on both what might be related to individual/team performance and what is attributable to the system and the organization.

3) **Education and training in the techniques of process improvement.** Both at regional and local levels training courses to learn from the best
clinical and organizational practices should be promoted, enhancing “positive deviance” approaches and individual and teams’ mobility. Furthermore, managerial techniques and competences should be spread-out among physicians since medical school education.

4) **Alignment of system/organizational incentives with care improvement objectives and leadership to inspire and model care improvement.**

There is the need to re-think organizational models in order to orient and motivate physicians change. This could be done by aligning purposes (in noble shared purposes) and supporting physicians with both extrinsic and intrinsic incentives. Both reputational pressure and the reinforcing of positive system beliefs and values help in this process. Nevertheless, career developments can provide incentives too and support physicians in leading the required change in the system. An interesting proposal of career development discussed at regional level is the one of the “professional head physician” (“primario professional”) (Amerini et al., 2014). This physician should be chosen through a rigorous selection process at “Area Vasta” level and would be designated for a specific highly specialized role aimed at improving identified criticalities in the area of interest. These kind of career developments are positive since they focus on the clinical competences of physicians, without forcing them in taking a “management route” that would drift them apart from the medical practice (Vize, 2015). At the same time, results from survey and from informed experience indicate that managerial training is one important factor that predicts physician leader success (Williams et al, 1997). However, managerial training alone is not sufficient to provide leadership skills to physicians (Kinding, 1997) and need to be supported by other factors, such as clinical experience, building credibility and trust, and working collegially and not individualistically (Kusy et al, 1995). For these reasons, career’s developments should be supported by peer review mechanisms and training sessions in the context of the “famiglie professionali” groups, in order to make physicians aware of their role and responsibility on populations’ outcomes and support them in leading the change.

In conclusion, this thesis contributes to the debate about strategies and levers to engage physicians, by providing a framework of application in a public regional
context (the Tuscan healthcare system) and three different cases of implementation. Its originality regards the development not in a single private organization, but in an integrated public healthcare system. Furthermore, the engagement is only the first step for broader responsibility of physicians in the value-for-money interventions provided to the population and in the lead of the required change towards population-medicine approach. Making the physicians work together with colleagues, researches and managers by sharing administrative data and performances with a benchmarking approach is essential to engage them and improve their practices. Physicians’ enthusiasm and the results obtained in the cases proposed both in improvement and learning suggest that the engagement approach used is effective, thus deserving further development and research.

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Acknowledgements

Thinking about how to write this last part of the thesis, I realized this will be my last thesis, the conclusion of a long path of studies and works, obstacles and satisfactions. I think this process has made me grow a lot both personally and professionally, pushing me to always improve and learn new things. During this pathway I encountered really amazing people that I want to thank with all my heart for their support and help.

Firstly, I wish to thank my tutor, Prof. Sabina Nuti for stimulating me in the research, for engaging me in many projects and learning activities and for her sincere enthusiasm in both researching and working. In this sense, I am particularly grateful to her for introducing me to Prof. Adalstein Brown, Prof. Gwyn Bevan and Sir Muir Gray. They all are a great source of inspiration.

Then, I want to thank all the faculty and staff of the Institute of Management of the Scuola Superiore Sant’Anna for their valuable insights during courses and presentations. The Scuola Superiore Sant’Anna gave me a lot during these years both as a PhD student and in the previous years as “allievo ordinario” and I am really thankful for the great opportunity I had to share my time with such interesting and valuable people.

A special thanks to the MeS-Lab colleagues: the most gorgeous group of people I have been working with. You made these three years (almost four) easier and funnier and you provide me with many beautiful friendships.

I wish to thank also my new colleagues at the Laboratorio Formas: it has not been easy for me to work and study at the same time during these months, but you supported me a lot and I am very grateful for that.

And then I want to thank all the friends that helped me in balancing my life-work-study-research time, making me relax and enjoy all the little (maybe not so little) things that I tend to ignore too much often.

I wish to thank my parents for their support and love. I know that you probably understand little of what I have done in these years, but you have inspired most of my job: you definitely are the physicians everybody would like to meet and the people everybody should try to be.

Finally, I wish to thank Luca, my companion, who has always supported me during these years and who helped me in finding myself and realize my objectives, making me feel always loved and safe.