

**ACCOUNTING INFORMATION TOOLS IN MANAGERIAL CLINICAL
SERVICE DECISION-MAKING PROCESSES: Evidence from Portuguese public
hospitals**

INTRODUCTION

Several decades ago, the introduction of New Public Management (NPM) in hospitals brought a new set of values where accounting was central (Jacobs et al. 2004; Jones and Dewing 1997). On behalf of a ‘more cost-efficient (and effective) lines’ (Andrews and Walle 2012, 3), planning and control has become accounting-supported, especially in terms of inputs, outputs and performance measures. With deregulation and improved accountability requiring more responsive and flexible public services, physicians are required to achieve greater efficiencies (Naranjo-Gil and Hartmann 2007) and to facilitate transparency in their professional organizations (Kerpershoek et al. 2014). These requirements may reinforce the organizational power of this ‘administrative elite of professionals’ (Freidson 1984, 1), i.e., physicians or surgeons, who simultaneously assume managerial responsibility in public hospitals.

Sophisticated information systems (IS) are available to help doctors manage and exercise administrative control over their colleagues’ work. These IS integrate data that emerge from within the medical profession together with data that stems from accounting information tools (AIT). In this context, physicians with medical training are faced with the need to learn and interpret a new language: accounting. Business plans, contract programs, budgets, cost accounting, balance sheets, profit and loss accounts, and other management reports are AIT outcomes that become part of the physician’s vocabulary.

Even more, physicians are conscious that their performance will be judged under economic criteria, based on the evaluation that these AIT make of their daily activity. Attitudes towards AIT vary not only from country to country (Kurunmäki 2004), or hospital to hospital, but even among physicians within the same hospital. Some of them simply opt ignoring the information supplied by AIT, while others use it for planning and control, even if they consider that it amounts to exerting pressure over their colleagues' work or imposes financial constraints in terms of the clinical activities that they provide. Obviously, physicians' attitudes towards AIT are a critical issue for the efficiency of hospitals: the acceptance of AIT by users is a prerequisite for utilizing it (Jessup et al. 2010; Eldenburg et al. 2010). Physicians appreciate the new information tools only when they notice that the accounting information improves their clinical decision making (Kazahaya 2005; Padovani et al. 2014). However, typically they frame this information as complex and hard to understand (Pettersen and Nyland 2012).

A stream of the current debate is focused on how to gain physicians' acceptance of AIT. A myriad of economic, institutional, organizational and behavioral factors all seem to have the potential to favor the use of accounting tools by physicians (Pomberg et al. 2012). Remarkably, structures such as formal authority, have proved to facilitate the use of AIT in decision making (Abernethy and Vagnoni 2004; Pettersen 2013), e.g., by empowering physician managers in organizational charts of hospitals. However, to the best of our knowledge, these prior studies did not link these formal changes to any evolution of informal organizational processes. In this paper we want to shed light on different informal factors that might influence Directors of Clinical Services (DCS)'

attitudes towards the use of AIT to enhance efficiency in decision making by physicians, focusing on the non-accounting factors resulting from the daily interactions with other physicians and hospital managers, and are susceptible to impact on the attitudes of DCS towards AIT.

To behaviorally explore this issue, we take as the point of departure the study of Abernethy and Vagnoni (2004), re-delineating their proposal to include the joint influence of formal and informal elements on decision management based on information supplied by the AIS. For our study, we interviewed a group of DCS at two public Portuguese hospitals. We found that formal factors such as the information characteristics, cost consciousness, and the anticipated use of AIT to control performance were relevant for understanding DCS's use of AIT. However, we also found that the transformational leadership style of more senior doctors-managers, professional autonomy of physicians, and their informal authority enhanced their use of AIT. This information is of interest for researchers and, on the practical side, our study provides politicians and government officials with information about the factors on which to focus their attention in order to encourage the use of AIT by DCS in public hospitals to enhance efficiency and, consequently, direct doctors towards a greater commitment to this value in hospital management.

The paper is structured as follows. In the next section, after presenting Abernethy and Vagnoni's (2004) theoretical framework and our amendments, we formulate seven hypotheses. The third section describes the empirical data from the questionnaire. The fourth section provides empirical findings that support the validity of the amended

framework. Finally, we discuss the results and conclude with our contribution to extant knowledge. We also explore the limitations of our study and propose areas for future research.

THEORETICAL FRAMEWORK AND HYPOTHESES

From the orthodoxy of rational models to bureaucratic and political approaches, seminal literature in AIT has paid attention to how their information shape decisions made in complex organizations (Jensen and Meckling 1992; March 1997). When decision making is understood as a rational procedure, AIT is typically seen as ‘facilitator of decision-making’ (Mouritsen and Kreiner 2016). In the context of public hospitals, this means that AIS are tools that aim to help DCS to improve the choices they make through the constant pursuit of the ‘best information’. This idea of AIS is grounded on agency theory. Strategic management is seen as a planned, intentional and rational act. Economic actors are self-interested, and conflicts of interest are resolved through a prior contract by which employees agree to pursue the interests of their principals (owners, upper-level managers, etc.). Nonetheless, actors are significantly constrained by the asymmetries of information and AIT is used by actors to reduce their uncertainty. This rational model is applicable to public hospitals because economic efficiency has been an important consideration since the NPM reform (e.g., Padovani et al. 2014). Current hospital management models seek to develop a rational economic sense in the behavior of all those DCS who assume management responsibilities. Under these circumstances, the use of

accounting information provided by AIT for decision making is a natural consequence (Simonen et al. 2009).

Our research investigates diverse formal and informal factors that affect the way DCS use AIT. Physicians typically frame accounting information as complex and hard to understand (Pettersen and Nyland 2012). However, diverse economic, institutional, organizational and behavioral factors have the potential to favor the use of AIT (Pomberg et al. 2012). Remarkably, formal authority is able to influence the perception that DCS have about accounting information and their use (Abernethy and Vagnoni 2004; Pettersen 2013). Abernethy and Vagnoni (2004) also found that decision management, understood as the use of AIT in decision making by DCS, was directly influenced by information characteristics. Since this study was developed in a public healthcare arrangement and in a hospital whose structure is similar to those of Portugal we analyze, we expect that DCS perceptions about formal authority and information characteristics also influence their use of AIT. Figure 1 displays the original model proposed by Abernethy and Vagnoni (2004, 218) where decision management (and also decision control) depends on three factors: formal authority, information characteristics, and informal authority. Whilst formal authority derives from allocating decision rights, informal authority operates via individual power and influence. This model anticipated a positive effect of the use of AIT for decision management and decision control on the cost consciousness of physicians.

<<< Insert Figure 1 about here>>>

Differently from Abernethy and Vagnoni (2004), we focus on decision management, i.e., the use of AIT by DCS for decision-making. We frame seven formal

and informal factors that potentially influence decision management by complementing Abernethy and Vagnoni's three factors with cost consciousness, decision control, transformational leadership, and professional autonomy. First, we consider that cost consciousness is an antecedent of the use of AIT because DCS's ability to use accounting information comes from their commitment to managerial issues. Second, the anticipation of DCS about the use of AIT that his/her superior makes for ex post control over DCS, influences their use of AIS, i.e., their decision management. Third, informal factors like leadership and professional autonomy, which capture the impact of professional commitment, have a positive influence on the use of AIT by DCS. Leadership is relevant because hospitals operate with highly qualified professionals (e.g., doctors) who are, in fact, highly politicized individuals. Employees usually grant authority and accept orders when the authority of leadership is combined with the authority of position. Previous research confirms that an active leadership style exerts a positive effect on improvement and innovation in the healthcare system (Nieboer and Strating 2012), although with limitations (Touati et al. 2006).

Prior literature points out that trust can be viewed as complement or substitute to the control systems in the accounting decision making processes (Dekker 2003). Thus, trust may be seen as opposite, substitutive and also interactive with control and management control systems in intra-firm relationships (Langfield-Smith 2008). Here, we defend that trust and control systems are viewed by DCS as complementary. Therefore, we hypothesize the positive effect of a more senior doctor's leadership style on the use of accounting data by DCS for decision management.

Bass and Avólio (2004) conceptualized leadership into three different behavioral models, ranging from a non-leadership attitude described as *laissez-faire* style, through a style centered on a punishment/reward system, described as transactional leadership, and finally transformational leadership. This last leadership style is based on an inspiring leader who encourages physicians to give more and go far beyond what is expected of them, motivated by their feelings of trust, admiration and respect towards their leader. We focus on this type of leadership because in the context of hospital organizations, where DCS are highly qualified and skilled, the most cooperative style of leadership, i.e., transformational, should lead to the highest levels of organizational commitment. This rationale is based on previous research proposing that real leadership, which promotes collective responsibility, is a suitable solution to problems related to efficiency in health service management (Firestone 2010; Judge and Piccolo 2004; Spinelli 2006). Thus, we formulated our first hypothesis:

H1: The perception of DCS that their hierarchical superiors are transformational leaders positively influences their use of AIT for decision management.

The second factor that influences the use of AIT is professional autonomy. DCS are highly socialized groups of individuals with medical values and professional standards who are trained to respond to a model of professional control, which is generally antithetical to most types of administrative control (Greenwood et al. 2002). Unlike the level of economic and political autonomy of the medical profession, which varies from country to country, the technological or scientific medical autonomy seems reasonably similar (Harrison and Ahmad 2000). AIT are focused on management objectives while

professionals are focused on meeting their standards and cognitive beliefs (Kerpershoek et al. 2014). In the past, clinical experience guided the choice of treatment by DCS: a drug that worked in clinical practice was considered an effective treatment (Armstrong 2002). First-hand contact with patients and disease were the ultimate justifications for deciding to use one treatment procedure in lieu of another, and the experience so gained was valued because it provided a basis for therapeutic choice. But more recently, there have been important changes in the predominant model of professional control. Professional standards, such as evidence for, or against, a clinical intervention (i.e., evidence-based medicine (EBM)) and therapeutic protocols, as defined by professional ‘elite knowledge’, have significantly changed the traditional indicators of hospital production and quality (McDonald et al. 2009). As a consequence, individual clinical experience of DCS has been progressively replaced by a new hierarchy of medical knowledge that celebrates the weight of these professional standards. Ironically, while these standards might enhance the defense of collective autonomy, they do so at the expense of individual practitioners who are expected to act within the decision rules provided by the evidence base (Armstrong 2002). This autonomy is not absolute, and its scope and boundaries are not always the same.

If medical autonomy is evolving towards a collective autonomy based upon EBM, the need to be “efficient” in management of public hospitals is associated to the implementation of new regulations and stronger external controls, there is a potential threat to collective autonomy (Jones and Dewing 1997). Some authors have claimed that medical ‘collegial regulation’, or professional self-regulation, is losing ground to so-called

economic ‘bureaucratic regulation’, characterized by the proliferation of record-keeping requirements and the development of systematic methods for reviewing those records, facilitated and accelerated by the computer. Clinical autonomy feels restricted by these accounting measures. Many doctors hardly accept managerial criteria perceived by them as being imposed in public hospitals and applied through AIT because they feel that their autonomy is menaced (Humphrey and Russell 2004). Besides, the advance of medical science has favored the clinical standardization of practices inside and across hospitals. This clinical standardization (e.g., the establishment of protocols) makes clinical behaviors easier to anticipate, also facilitating economic standardization, which is the base of AIT. Therefore, we expect that DCS defending professional autonomy within the clinical unit will not be receptive to economic bureaucratic control tools, like AIT.

H2: The support of DCS to professional autonomy of doctors working in their units negatively influences their use of AIT for decision management.

The hospital structure of formal authority results from a conscious and deliberate choice in the distribution of decision-making powers across the chain of command, as displayed in its organizational chart. Formal authority structure is closely linked to hospital management structures. In particular, formal authority in a hospital is based on decisional power, which is supported and reinforced, at the same time, by the availability of financial information for having control of these decisions (Rayburn and Rayburn 1997), i.e., in AIT. Previous research suggests that clinicians find that the use of AIT paves the way for them to strengthen their position in the formal hospital structure. For example, Degeling (1994) found that there is a positive relationship between an effective

redesign of formal authority structures and the use of AIT information. Also, Abernethy and Vagnoni's (2004) model recognizes that formal authority positively influences decision management. We therefore expect that the delegation of economic decision making through a formal authority structure to DCS will positively affect the use of AIT in managing activities within clinical directorates:

H3: The assumption of economic responsibility by DCS through a formal authority structure positively influences their use of AIT for decision management.

The structure of formal authority (legitimate power) does not fully represent the relationship between the various actors within the organization. An additional informal authority (no legitimate power) structure is developed in parallel to formal authority. This informal authority determines the ability of individuals or groups of individuals to influence decisions within the organization according to their self-interest. We define informal authority as the degree of influence on the day-to-day management of the hospital. The conciliation of tensions between the interests of the organization and those of subgroups and individuals require continuous negotiations and renegotiations, and consistency is rarely achieved and difficult to sustain. Bhimani (2003) assessed the positive relationship between the success of the implementation of a new accounting information system and the alignment of personal culture with organizational culture. Similarly, Doolin (2001) suggests the importance of consensus-oriented and team-based decision-making processes for achieving goal congruence between isolated or colligated interests and organizational interests. Informal power increases alongside a decreasing number of punishments and an increase in access to information, certainty, expertise,

credibility, status and prestige; access to members of the highest hierarchical levels; control of money and rewards. Considering hospitals, doctors are the group that has traditionally formed the ruling coalition, and their power derives from their ability to control the revenue as well as their specialized knowledge and skills (Abernethy and Vagnoni 2004), from their professional independence (Rayburn and Rayburn 1997) and from their expertise (Freidson 1984). Because of their power bases, hospital clinical and medical directors often perceive that they have more informal than formal authority, especially in unstable or uncertain environments. Hence, the use of informal authority becomes a necessary device for achieving a smooth adaptation of public hospitals to the setting in which efficiency is a core value.

Although the issue of informal power influencing the use of AIT for decision management is included in Abernethy and Vagnoni's (2004) model, they did not find any empirical support for this idea. We anticipate that, as DCS perceive that they are able to influence decisions at a higher level of management, they become more committed to top management strategic options and economic objectives such as efficiency, and therefore would have a greater desire to contribute to the success of the project. Thus, we expect a positive relationship between this 'informal power' and the use of AIT in decision making.

H4: The belief of DCS that they are able to influence decisions at a higher level positively influences their use of AIT for decision management.

The design of an accounting information structure in the healthcare industry to support the decision-making process is an important task that has to be based on strong

assumptions and users' needs (Kuziemyky and Lau 2010). User information satisfaction can be defined as the extent to which users believe the information system available to them meets their information requirements, and the extent to which they make effective use of this information (Macinati 2011). An ontological perspective can help to design and validate structures and characteristics of information systems. Although a comprehensive instrument for measuring the success of AIT does not yet exist, some generally accepted measures and principles are currently in use. Following Abernethy and Vagnoni (2004), we advocate that information characteristics are particularly important in motivating the use doctors make of information in managing clinical activity, with doctors using information if they perceive it to be relevant and accurate.

H5: The satisfaction that the DCS feels about the information characteristics of AIT positively influences their use of AIT in decision management.

Decision control refers to the successful exercise of power to influence employees' behavior in organizations (Belaya and Hanf 2009). Management accounting techniques, such as budgets, are an important tool of control. Accounting theorists have long accepted AIT as an integral part of the management control system of an organization and have acknowledged that such systems provide critical decision-influencing and decision-facilitating information. The management control system specifies (a) the performance measurement and evaluation system for each subdivision of the company and each decision agent, and (b) the system that relates individual rewards and punishments to performance. This system seeks to encourage organizational members to take actions and make decisions that are consistent with the objectives of the organization (Iveroth et al.

2013). Although Abernethy and Vagnoni (2004) found no relation between the use of AIT by DCS and control of DCS by AIT, performance of DCS, as the economic responsibility of the unit, typically is reported by the AIT. Upper-level managers use, to some extent, AIT reports for evaluating and rewarding DCS. We discuss that clinicians have this use of the control system in mind when they decide whether to use AIT information in decision management.

Authors such as Pettersen (2013) have linked the institutional pressure to use AIT with the involvement of managers in control procedures. If doctors are conscious that AIT information is used by their medical director to measure their performance, they tend to take AIT information into account in their decision making (Pettersen and Nyland 2012). Indeed, if a DCS perceives their hierarchical superior as a regular user of AIT, then it seems to be natural for the DCS to pay special attention to the same information.

H6: The more DCS realize that their hierarchical superiors use AIT for management control, the more they use AIT for decision management.

Medical work is processed within an epistemological structure of power that has resisted the fragmentation introduced by the public accounting sector (Llewellyn 1998). The power that doctors have within hospitals has allowed them to use resources without being concerned about the consequences these decisions have on efficiency (i.e., on costs) and, thus, on the financial viability of the hospital. However, this situation is changing, and increasing cost awareness among DCS is reported in comparison to some years ago (Hanlon 2001; Jakovljevic 2013). In fact, economic criteria are already accepted as useful information for decision making regarding health technology (Lopez-Bastida et al. 2010).

This DCS cost consciousness is crucial to understanding the use of AIT by clinicians (Abernethy and Vagnoni 2004). The use of AIT increases as constraints on spending increase (Hill 2000). The lack of funding creates cost consciousness (Tilburt et al. 2013), and as Van de Wetering et al. (2012) proposed, economic criteria may help in the decision-making process. However, we see this cost awareness as an antecedent, and not as a consequence, of the use of AIT. In other words, we argue that if professionals are concerned about the economic consequences of their clinical decisions, they will be more inclined to use AIT information for their decision making.

H7: The cost-awareness of DCS positively influences their use of AIT for decision management.

With these seven hypotheses, we propose a model to study the factors that influence the use of AIT by DCS in their decision-making processes (Figure 2).

METHODOLOGY

Research Setting

To build our variables, we collected data from DCS who occupied job positions in two similar hospitals in Portugal. Both were teaching and central public hospitals, with similar organizational structures, located in the same city. The hospitals faced a similar political, economic and regulatory environment, had the same funding arrangements, and were organized in similar internal formal structures. Both of them were transformed to public enterprises in 2005. Since then, the board of these hospitals has signed a yearly contract with the Portuguese Ministry of Health. They use private management tools and

follow a public funding system based on outputs (Table 1). The similarities between these two hospitals led us to join them in a single data set. Teaching hospitals are an adequate research environment for our topic, as they usually are referred hospitals in the national health systems, and have a complex management (Trotta et al. 2013).

<<< Insert Table 1 about here >>>

For the last decade, like other European countries, the Portuguese healthcare system has faced financial difficulties and economic constraints along with increasing demand for limited resources. Earlier, the traditional skepticism of its Napoleonic system to managerialism in the public sector sometimes produced a formal and legalistic accountability (Peters 2008). However, this economic situation has created the ideal context for real reform in Portuguese hospitals based on NPM ideals (Rego et al. 2010). In 2003, therefore, the Portuguese government introduced a structural reform of healthcare, mostly directed at public hospital management. The intention was to implement an irreversible reform (Guichard 2004). Hospitals in the public sector faced administrative and structural changes that strongly affected their management. The reform gave public hospitals more autonomy in their own management options and increased the business-like strategies and activity of hospitals. As a consequence, public hospitals in Portugal have become autonomous units (non-profit corporations) much like the hospital trusts created by the reform of the National Health Service in the UK. Each hospital prepares a business plan, budget proposal and contract program, which, after being approved, serves as a basis for performance evaluation through analytical accounting and budget control. The ending of this process is the balance sheet, profit and loss account and management

report. Hospitals are not managed directly by the Ministry of Health, but act as semi-independent autonomous units within the civil service, having much more authority in dealing with personnel, budgets and capital. In Portuguese public hospitals, medical work is organized by clinical specialty and most patients will receive all their hospital care under a single specialty. The bulk of funds spent in public hospitals is directly related to decisions made by physicians and surgeons within these clinical specialties. Each clinical area is headed by a DCS, a physician or surgeon with managerial responsibility.

Since then, AIT has experienced substantial changes and an increase in its importance in the management decision process. Most of these changes have been targeted towards middle managers and led to substantial changes in the authority structures in which these middle managers are involved. This has creating a favorable environment for fostering the use of AIT in decision making.

Sampling Procedure

To guarantee the quality of our survey data, we followed the recommendations of other researchers who have used similar approaches (e.g., Diamond 2011). For instance, to guarantee reliability and validity in this field research we follow those strategies and tactics recommended by McKinnon (1988). We constructed a questionnaire based upon a set of questions to shape discussions during meetings (Appendix 1). We also used survey instruments previously used in hospitals by Abernethy and Vagnoni (2004) for the behavioral constructs: *Formal Authority*, *Informal Authority*, *Information Characteristics*, *Decision Management*, *Decision Control* and *Cost Consciousness*. We used the survey

instrument developed by Bass and Avólio (2004) to test *Transformational Style*. We also developed our own questions on *Professional Autonomy*, which elaborated on issues emerging from our literature review and our research goals. Prior to conducting personal interviews with DCS, we translated the questionnaire from English to Portuguese following Behling and Law's (2000) recommendations.

We personally interviewed 69 of the 90 DCS occupying positions in the two hospitals, 40 from the first hospital and 29 from the second, giving a response rate of 77%. At the time of the interview, we briefly explained that our purpose was to collect data for research. We promoted free and spontaneous speech from the DCS. We took notes on their discourse, transcribed into the original language (Portuguese) and then translated into English. Prior to each interview, we reviewed all the data collected up to that point in time. Given that one of the objectives was to verify whether doctors spontaneously mentioned economic and financial issues as one of the factors considered in the clinical decision-making process, and to ensure that the interviewees were not directed towards that specific question, the interview began with an open question. We asked the DCS how they make their clinical decisions and to explain, openly, what type of information and which factors they take into account when they have to make a decision as to the use of diagnostic tests or prescriptions. All of them used AIT information to a certain extent in their decision management. During the interview, the DCS were invited to complete the survey as figured in Appendix 1. These questions were taken from earlier literature review and our research goals in relation to this topic (Strauss 1987). With this predetermined set of questions, our aim was to increase the reliability of our data, by

trying to ensure that all our respondents followed similar criteria (Mason 2002). The respondents fill in the questionnaire by themselves. During the filling out of the forms, we play a neutral role, although we solved the few doubts that arisen during the process. We use the notes registered during the open speech to assess coherence and reliability of the respondents' answers (McKinnon 1988). We also agreed on providing managers feedback on our results as and when requested.

DCS were asked to think about questions in relation to their current position and the last accounting information from AIT that they receive. By asking DCS to reply in relation to their situation both before and after they had received their information from AIT for decision management, we distinguish between their perceptions on both occasions (Gago-Rodriguez and Purdy 2015). This before-after distinction had no power to alter the prior causal-effect beliefs of managers, because they would discard any belief whenever certain that there was no causal link (Perales et al. 2010).

The confidentiality agreement reached with the second hospital limited our disclosure of information on the sample, so we can only report details about the first hospital. The average seniority of the DCS in their current positions for the whole sample was 9.9 years (SD = 5.03); 28 of them were Ph.D.'s (40.6%). All of the interviewees worked as head of services, but 20 (29%) were graduate assistants with a lower administrative classification than the other 49 (71.0%) who actually were, and worked as, heads of service. The sample from the first hospital included 62.5% males; the average age was 56.4 years and the average seniority as doctors was 31.3 years. In order to test

how each proposed factor really behaved in this sample, we decided to retain the original data and not exclude any participant from the sample.

Variable Measurement

We calculated Abernethy and Vagnoni's (2004) constructs as the authors proposed, using the average of values for the elements that compose each construct. These constructs are: *Formal Authority*, *Informal Authority*, *Information Characteristics*, *Decision Management*, *Decision Control*, and *Cost Consciousness* (Appendix 1). Following the same method, we built our original construct, *Professional Autonomy*, as the average value of its elements (Appendix 1). We used the (under copyright) Multifactor Leadership Questionnaire (MLQ) developed by Bass and Avólio's (2004) for *Transformational Leadership Style*.

RESULTS AND DISCUSSION

The analysis of Cronbach's alphas obtained with SPSS 19 (Table 2) indicates the reliability of the constructs' scales: the Cronbach's Alpha of the factors was at or close to the recommended cut-off point of 0.7 (Nunnally 1978). We also performed a factor analysis that confirmed construct validity, showing that all the factors tested in our model were significantly associated with the dependent variable. Sampling was also adequate: the Kaiser-Meyer-Olkin (KMO) measures were up to 0.5 and the levels of significance of Bartlett's tests for homogeneity of variances were lower than 0.05, the cut off points

recommended by Nunnally (1978). We did not find any multicollinearity among independent variables (Table 2).

<<< Insert Table 2 about here>>>

The correlations among factors are shown in Table 3. The correlation analysis revealed that the variables *Informal Authority* (0.453, p -value < 0.001), *Decision Control* (0.573, p -value < 0.001) and *Cost Consciousness* (-0.436, p -value < 0.001) are highly correlated with the dependent variable, the first two in the direction hypothesized and the third one in a negative direction. The variable that represented the leadership style, *Transformational Style*, is correlated with *Professional Autonomy* (0.274, p -value < 0.050) and *Formal Authority* (0.362, p -value < 0.010), but not with the dependent variable. *Cost Consciousness* is correlated with the three variables that we considered related to it: *Information Characteristics* (0.271, p -value < 0.050), measuring the feeling towards the AIT, *Formal Authority* (0.292, p -value < 0.050), forcing the use of AIT, and *Decision Control* (-0.462, p -value < 0.001), reflecting the economic consequences of the use of AIT for behavior control. As expected, *Formal Authority* is positively correlated with *Information Characteristics* (0.494, p -value < 0.001) and negatively correlated with *Decision Control* (-0.365, p -value < 0.010), and *Information Characteristics* and *Decision Control* (-0.351, p -value < 0.010) are negatively correlated.

<<< Insert Table 3 about here>>>

We conducted a regression analysis (Table 4). Our model emerged as significant ($R^2 = .53$; $F = 9.80$; $p = 0.00$):

<<< Insert Table 4 about here>>>

We found four factors that emerged as significant predictors for the use of AIT information: *Transformational Leadership Style* ($\beta = 0.345$, p -value < 0.050), *Informal Authority* ($\beta = 0.404$, p -value < 0.001), *Information Characteristics* ($\beta = 0.185$, p -value < 0.100) and *Decision Control* ($\beta = 0.423$, p -value < 0.001). These results support four of our hypotheses (Table 5).

<<< Insert Table 5 about here >>>

Our results support our first hypothesis (H1). We found that if the DCS perceives their hierarchical superior to be a transformational leader, this positively influences the DCS's use of AIT in decision making. Following a transformational leader appears to motivate DCS to use AIT. If DCS manifest trust and admiration towards their upper-level managers, they are more committed to the use of AIT in their management decisions. This result can be interpreted in relation to previous research on the dilemma of trust and control. Our finding seems to support the thesis that trust and control systems are viewed by DCS as complementary. This result might also show the DCS's acceptance of the accounting role inside a formal authority structure. Although earlier studies addressed traditional skepticism in Napoleonic systems, as in the Portuguese healthcare system, to make accountability difficult to accept (Peters 2008), intentionally associating accountability to formal structures in public hospital management facilitates the use of AIT.

Our data do not support hypothesis 2 (H2). As discussed, in the past, professional autonomy has tended to dominate over individual autonomy in the medical profession. The standardization of clinical procedures, e.g., through protocols, has been carried out

following generally accepted medical criteria, without taking into account any economic aspects. It may explain that this standardization does not facilitate the use of AIT, whilst a more individual-based setting limits it. This result deserves further research, as it might mean that the advantages of clinical standardization are not captured by the Portuguese reform, when clinical standardization facilitates decision-making based on economic criteria. We can also interpret this result as a consequence of the not enough involvement on physicians with access to AIT in the standardization of clinical procedures.

Our results indicate that the formal position in the hierarchy is not relevant to understanding the use DCS made of AIT. Hence, hypothesis 3 (H3) is rejected. However, we demonstrated the validity of hypothesis 4 (H4); that is, if DCS feel that they possess informal authority, they do use AIT. It seems that the DCS need an authority based on their own scope of influence to use AIT. If we analyze H3 and H4 results together, our findings could represent the DCS's rejection to the use of economic criteria as a complement to clinical criteria. Only when there is an informal authority structure do DCS decide to use AIT in decision management.

We also find support for hypothesis 5 (H5). The satisfaction of DCS with information characteristics seems to have a positive effect on the use of AIT for decision management, although it is not a strong influence. The perception of relevance of the system for decision making prompts its use. The results also support hypothesis 6 (H6), which refers to the importance of the use of AIT by upper-level managers. If DCS realized that their hierarchical superiors used AIT for management control, then they used AIT more in their decision management. Hence, the position of the DCS in the hierarchy

was not relevant in the use of AIT. However, when more senior doctors used AIT to control DCS, then DCS use of AIT became a protective ‘shield’ over their decision-making processes. This result, as for H1, also supported the idea that trust and control systems are supplementary. We could think of this as a mimicking of the leader. If he or she was convinced of the utility of AIT and used it, the subordinates were also prone to use it. Finally, we rejected hypothesis seven (H7) as there was no positive effect of cost awareness on the use of AIT in decision management in our sample. This is a quite surprising result to us. However, it is possible that even though the DCS are aware of the cost importance, they do not feel AIT is the appropriate tool.

Our final model is represented in Figure 2, as follows:

<<< Insert Figure 2 about here>>>

CONCLUSIONS

Previous research indicated that the implementation of a common group of strategic initiatives for public hospitals in different countries seeking to achieve greater efficiencies cause a change in the type of information that DCS use to make decisions in hospitals (e.g., Naranjo-Gil and Hartmann 2007). The introduction of this economic perspective into the decisional framework of DCS has to be understood as the addition of a set of financial and controlling criteria into public hospitals, a system of making-decision that before only required the use of clinical criteria by DCS. This change has important consequences on the development of their daily medical activity. The challenge

is to create a new informational habit in DCS who heretofore have only been accustomed to the clinical information common to them.

Although the majority of DCS positively appreciate innovations related to AIT, some clinicians show a certain resistance to using AIT (Eldenburger et al. 2010; Pettersen and Nyland 2006). DCS sometimes argue that the use of AIT for making clinical decisions negatively affects the quality of the medical services they provide. However, citizens finance public hospitals through their taxes, so they require quality of clinical services to be achieved not only without waste, but also at a reasonable cost. This guarantees the long-term sustainability of public healthcare within the setting of an ageing population. The role of AIT is to provide information to support a hospital management safeguarding these two demands.

The objective of this paper is to contribute to the current debate in literature and practice by investigating the non-monetary factors that motivate DCS to use AIT. We research different factors that influence DCS' attitudes towards the use of AIT in management decision making. Specifically, we analyze the impact of aspects related to the authority structures in which these DCS are involved..

Previous literature has focused on low-level subordinates or, alternatively, top managers. Our paper has a novel approach as it specifically focuses on middle-level managers, i.e., doctors. The interest of our approach is that in a public hospital this middle-level is the position that supports the latent conflict between clinical and economic criteria in the decision-making processes.

We found that the presence of a transformational style of leadership among senior managers positively affects DCS use of AIT. As this style is motivated by feelings of trust, admiration and respect towards their senior managers, we presume that the clinicians considered the existence of a positive relationship between management based on these values, and the use of AIT in management. Our results point out that trust and control systems are complementary. Practically, senior managers in the hospital structure are the promoters of the use of AIT. Values that DCS project, such as respect and esteem towards their senior managers, make DCS easily follow the signs of the former regarding the use of AIT.

The outcomes of our study also indicate that DCS use AIT for their decision making if they feel that colleagues, whose authority is based on expertise (that is, these colleagues have informal authority and not necessarily authority related with their position on the formal hierarchical authority), recommend its use. From a theoretical viewpoint, this result is coherent within a highly professional structure, where all physician-members are highly qualified and have a well-recognized status. Our results also point out that clinical independence of DCS enhances the use of AIT: more clinical freedom for DCS translates into use of AIT. A plausible explanation is that these DCS seek for additional support to justify their decision management, and they find it in the AIT outputs. This finding suggests that public hospitals may wish to take a critical look at their practices in clinical standardization, as these may reduce the opportunity for balancing the use of clinical and AIT information by DCS.

Another factor that we have found to be significant is the design and characteristics of the information provided by AIT. DCS satisfaction with AIT information characteristics has a positive effect on its use for decision management. If middle-level managers consider that the AIT design includes issues assessed as important, they will increase its use. Previous training and participation in design are possible ways to align DCS with the AIT design.

The results of our analysis also suggest that DCS use AIT for their decision making if they consider that the information provided by AIT is used by their senior managers to control them. Clearly, the interest of DCS in AIT is enhanced by this use. It may be that DCS know and use the informative outputs of AIT and they feel more comfortable being controlled by a more familiar model.

In sum, we found that DCS use more AIT for decision management when they perceive that their hierarchical superiors are transformational leaders, when they feel they have informal authority, when they are satisfied with the information characteristics of AIT, and when they realize that their hierarchical superiors use AIT for management control. Three of these dimensions that positively affect the use of AIT (leadership style, informal authority, information characteristics) are representative of non-material recognition of high value in a professional environment, such as hospitals. The fourth, use as a control system, represents a practical perspective: if the DCS knows that they are going to be controlled using a certain tool, this control can be simplified and evidence can easily arise if the decisions are made with the same tools. Such control might be a procedure to facilitate daily activity.

Theoretically, we contribute to the debate in public management research. This investigation seeks factors that foster best practices in delivering clinical services in a cost-effective manner. Daily decision-making is in the hand of physicians. Hospitals want personnel to balance economic and clinical concerns. AIT provides them with information useful for deciding. However, this is not a simple agency problem between principals (senior managers) and passive agents (physicians). Here agents are actors forced to apply their rationale to solve conflicts between their economic and clinical effort. They are susceptible to be motivated by different factors. From a practical perspective, our results might offer insights into politicians and hospital managers about concrete non-monetary factors on which they can built incentive systems to prompt and hearten the use of AIT by DCS in hospitals. Specifically, our conclusion apropos the strategy of promoting formal hierarchical position to drive the use of AIT is not successful. However, professional structures are relevant. We are also conscious that our recommendation about acting in the informal arena is not easily practicable. Formal relationships (including formal authority and non-transformational leadership style) are forced or imposed. However, informal relationships, i.e., those that are not specified in the organizational structure, are difficult to influence. We recommend that public hospitals carefully choose key clinicians to be involved in AIT design and implementation. DCS should have informal authority, gained based on expertise and performance. This result might be shaped by the country context. Portuguese hospitals have a rigid, formal and fully hierarchical structure. Besides, physicians in Portugal have a high status *per se*. Thus, as formal structures are established and assumed, informal structures may be further valuable.

Another practical implication of our results is that the control system of public hospitals must be linked to the AIT. Public hospitals must offer a system of monetary rewards linked to the use of AIT in decision management. DCS must be clear on the fact that a part of their incentives and promotions will be linked to the use they make of AIT. However, these incentives for the use of AIT must never conflict with medical practice.

Finally, our results confirm the importance of information characteristics for the use of AIT by Portuguese doctors. The outcomes of AIT will support DCS' decision-making process. If DCS feel that the AIT has an adequate design, incorporating the issues that they consider important for decision making, then its use will increase. The effect of information characteristics on the use of AIT should therefore be considered by politician and hospital managers when designing information models.

We recognize that there are some important limitations to our research. First, we interviewed Portuguese managers, who are susceptible to influence by specific cultural and domestic aspects. As we aforementioned, the Portuguese hospital system is formal and rigid, and Portuguese physicians have high power. The DCS we interviewed work at two public hospitals in the same city. Shared organizational and urban factors could therefore have biased our findings. We also admit that there are several psychosocial factors that may affect the use of AIT. The sample size is another limitation. In future research, we aim to collect additional data from other hospitals in Portugal and elsewhere in Europe. The model could then be structured and more widely sample-tested to explore the impact of different organizational realities on the use of internal information for decision-making of DCS. With an international sample, future research could analyze not

only the fixed effects, but also the random effects of countries to confirm or adapt our conclusions. We aim to extend our sample to other private and public Portuguese hospitals in future research. Our purpose is to further analyze the effects that ownership has on the attitudes of DCS towards the use of AIT in management decisions.

REFERENCES

- Abernethy, M., and E. Vagnoni. 2004. Power, organization design and managerial behaviour. *Account Org Soc.* 29(3–4), 207–225.
- Andrews, R and S. Walle. 2012. New Public Management and Citizens' Perceptions of Local Service Efficiency, Responsiveness, Equity and Effectiveness. COCOPS Working Paper No. 7, European Commission.
- Armstrong, D. 2002. Clinical autonomy, individual and collective: the problem of changing physicians' behavior. *Soc. Sci. Med.* 55, 1771–1777.
- Bass, B., and B. Avólio. 2004. *Multifactor Leadership Questionnaire. Manual and Sampler Set.* Redwood City, CA: Mindgarden Inc.
- Behling, O., and K. Law. 2000. *Translating questionnaires and other research instruments: problems and solutions.* Sage Publications, Thousand Oaks, CA.
- Belaya, V., and J.H. Hanf. 2009. A multi-theoretical perspective on power in managing interorganizational relationships. *Int. J. Soc. Econ.* 36(11), 1040–1049.
- Bhimani, A. 2003. A study of the emergence of management accounting system ethos and its influence on perceived system success. *Account Org Soc.* 28, 523–548.
- Chen, W. 2013. Does healthcare financing converge? Evidence from eight OECD countries. *International Journal of Health Care Finance and Economics.* 13(3-4), 279-300.
- Degeling, P.J. 1994. Unrecognised structural implications of casemix management. *Health Serv. Manage. Res.* 7(1), 9–21.
- Dekker, H.C. 2003. Value chain analysis in interfirm relationships: a field study. *Manage Account Res.* 14(1), 1–23.
- Diamond, S.S. 2011. *Reference guide on survey research.* 3rd edition. Washington D.C.: The National Academies Press.
- Doolin, B. 2001. Doctors as managers: New public management in a New Zealand hospital. *Public Manage Rev.* 3(2), 231-254.
- Eldenbug, L., N. Soderstrom, V. Willis, and A. Wu. 2010. Behavioral changes following the collaborative development of an accounting information system. *Account Org Soc.* 35(2), 222–237.
- Firestone D.T. 2010. A study of leadership behaviors among chairpersons in allied health programs, *J Allied Health,* 39, 34–42.

- Freidson, E. 1984. The changing nature of professional control. *Annual Review Sociology*, 10: 1-20
- Gago-Rodríguez, S. D.E. Purdy. 2015. The effects of budgetary knowledge and extrinsic motivation on the importance that managers attribute to their budgets. *Spanish Journal of Finance and Accounting / Revista Española de Financiación y Contabilidad* 44, 47-71.
- Greenwood, R., R. Suddaby, and C.R. Hinings. 2002. Theorizing Change: The Role of Professional Associations in the Transformation of Institutionalized Fields. *Acad. Manage. J.* 45(1), 58–80.
- Guichard, S. 2004. *The reform of the health care system in Portugal*. OECD Economics Department Working Papers 405, OECD, Economics Department.
- Hanlon, N.T. 2001. Sense of place, organizational context and the strategic management of publicly funded hospitals. *Health Policy*. 58(2), 151–173.
- Harrison, S., and W.I. Ahmad. 2000. Medical autonomy and the UK state 1975 to 2025. *Sociology* 34(1), 129–146.
- Hill, N.T. 2000. Adoption of costing systems in US hospitals: An event history analysis 1980-1990. *J Account Public Pol* 19(1), 41–71.
- Humphrey, C., and J. Russell. 2004. Motivation and values of hospital consultants in south-east England who work in the National Health Service and do private practice. *Soc. Sci. Med.* 59(6), 1241–1250.
- Iveroth, E., P. Fryk, and B. Rapp. 2013. Information technology strategy and alignment issues in health care organizations. *Health Care Manage. Rev.* 38(3), 188–200.
- Jacobs, K., G. Marcon, and D. Witt. 2004. Cost and performance information for doctors: an international comparison. *Manage Account Res.* 15, 337–354.
- Jakovljevic, M.B. 2013. Resource allocation strategies in Southeastern European health policy. *Eur. J. Health Econ.* 14(2), 153–159.
- Jensen, M., and W. Meckling. 1992. Specific and general knowledge and organizational structure. Werin, L.M., Wijkander, H. (Eds.), *Contract economics*. Cambridge: Blackwell Publishers.
- Jessup, M., M. Wallis, J. Boyle, J. Crilly, J. Lind, D. Green, P. Miller, and G. Fitzgerald. 2010. Implementing an emergency department patient admission predictive tool: Insights from practice. *Journal of Health, Organisation and Management* 24(3), 306–318.
- Jones, C.S., and I.P. Dewing. 1997. The attitudes of NHS clinicians and medical managers towards changes in accounting controls. *Financial Accountability and Management* 13, 261–280.
- Judge, T.A., and R.F. Piccolo. 2004. Transformational and transactional leadership: a meta-analytic test of their relative validity. *J. Appl. Psychol.* 89(5), 755–768.
- Kazahaya, G. 2005. Harnessing technology to redesign labor cost management reports. *Healthc. Financ. Manage.* 59(4), 94–101.
- Kerpershoek, E., M. Groenleer, and H. de Bruijn. 2014. Unintended responses to performance management in Dutch hospital care: Bringing together the managerial and professional perspectives. *Public Manage Rev* DOI: 10.1080/14719037.2014.985248
- Kurunmäki, L. 2004. A hybrid profession—the acquisition of management accounting expertise by medical professionals. *Accounting, Organizations and Society*, 29 (3-4), 327–347.

- Kuziemsky, C.E., and F. Lau. 2010. A four stage approach for ontology-based health information system design. *Artif. Intell. Med.* 50(3), 133–148.
- Langfield-Smith, K. 2008. The relations between transactional characteristics, trust and risk in the start-up phase of a collaborative alliance. *Manage Account Res.* 19(4), 344–364.
- Llewellyn, S. 1998. Boundary work: costing and caring in the social services. *Account Org Soc.* 23(1), 23–48.
- López-Bastida, J., J. Oliva, F. Antoñanzas, A. García-Altés, R. Gisbert, J. Mar, and J. Puig-Junoy. 2010. Spanish recommendations on economic evaluation of health technologies. *Eur. J. Health Econ.* 11(5), 513–520.
- Macinati, M.S. 2011. The use of management accounting system information in health care. The results of an empirical research. *Mecosan* 19(76), 9–22.
- March, J. 1997. *Understanding how decisions happen in organizations*. In Z. Shapira (Ed.), *Organizational decision making*. Cambridge, UK: Cambridge University Press.
- Mason, J. 2002. *Qualitative Research*. London, UK: Sage Publications.
- McDonald, R., K. Checkland, S. Harrison, and A. Coleman. 2009. Rethinking collegiality: restratification in English general medical practice 2004–2008. *Soc Sci. Med.* 68(7), 1199–1205.
- McKinnon, R. 1988. Reliability and validity in field research: Some strategies and tactics. *Accounting, Auditing and Accountability Journal*, 1(1), 34–54.
- Mouritsen, J.; Kreiner, K. 2016. Accounting, Decisions and Promises. *Accounting, Organizations and Society*, 49(2), 21–31
- Naranjo-Gil, D., and F. Hartmann. 2007. Management accounting systems, top management team heterogeneity and strategic change. *Account Org Soc.* 32(7–8), 735–756.
- Nieboer, A.P., and M.M.H.Strating. 2012. Innovative culture in long-term care settings: The influence of organizational characteristics. *Health Care Manage. Rev.* 37(2), 165–174.
- Nunnally, J.C. 1978. *Psychometric theory*. New York: McGraw Hill.
- Padovani, E., R.L. Orelli, and D.W. Young. 2014. Implementing change in a hospital management accounting system. *Public Manage Rev*, 16(8), 1184–1204.
- Perales, J.C., D.R. Shanks, D. Lagnado. 2010. Causal Representation and Behavior: The Integration of Mechanism and Covariation. *Psychology Journal*, 3, 174–183.
- Peters, B.G. 2008. The Napoleonic tradition, *International Journal of Public Sector Management*, 21(2), 118–32.
- Pettersen, I.J. 2013. Diverse management practices- a study of clinical managers. *Public Money Manage* 33(1), 39–46.
- Pettersen, I.J., and K. Nyland. 2006. Management and control of public hospitals - the use of performance measures in Norwegian hospitals. A case study. *Int. J. Health Plann. Manage.* 21(2), 133–149.
- Pettersen, I.J. and K. Nyland. 2012. Reforms and clinical managers' responses: a study in Norwegian hospitals. *J Health Organ. Manage.* 26(1), 15–31.

- Pomberg, M., H. Pourjalali, S. Daniel, and M.B. Kimbro, 2012. Management accounting information systems: A case of a developing country: Vietnam. *Asia-Pacific Journal of Accounting and Economics* 19(1), 100–114.
- Rayburn, J.M., and L.G. Rayburn. 1997. The changing power equation in hospitals. *J. Hosp. Mark.* 11(2), 115–132.
- Rego, G., R. Nunes, and J. Costa. 2010. Resource allocation strategies in Southeastern European health policy. *Eur. J. Health Econ.* 11(4), 367–381.
- Simonen, O., Viitanen, E., Lehto, J., and Koivisto, A. 2009. Knowledge sources affecting decision-making among social and health care managers. *Journal of Health Organisation and Management.* 23(2), 183–199.
- Spinelli, R.J. 2006. The applicability of Bass's model of transformational, transactional, and laissez-faire leadership in the hospital administrative environment. *Hosp. Top.* 84(2), 11–18.
- Strauss, A.L. 1987. *Qualitative Analysis for Social Scientists*. Cambridge, UK: Cambridge University Press
- Tilburt, J.C., M.K. Wynia, R.D. Sheeler, B. Thorsteinsdottir, K.M. James, J.S. Egginton, M. Liebow, S. Hurst, M. Danis, and S.D. Goold. 2013. Views of US physicians about controlling health care costs. *JAMA.* 310(4), 380–388.
- Touati, N., D. Roberge, J. Denis, L. Cazale, R. Pineault, and D. Tremblay. 2006. Clinical leaders at the forefront of change in health-care systems: Advantages and issues. Lessons learned from the evaluation of the implementation of an integrated oncological services network. *Health Serv. Manage. Res.* 19(2), 105–122.
- Trotta, A., Cardamone, E., Cavallaro, G., & Mauro, M. 2013. Applying the balanced scorecard approach in teaching hospitals: A literature review and conceptual framework. *Int J Health Plann Manage,* 28(2), 181-201.
- United States 2010. *Patient Protection and Affordable Care Act*. Public Law No: 111–148: H.R. 3590. March 23.
- Van de Wetering, G., W.H. Woertman, and E.M. Adang. 2012. Time to incorporate time in cost-effectiveness analysis. *Eur. J. Health Econ.* 13(3), 223–226.