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To cite this version:
Jane Despatin, Michel Nakhla, Eric Wable, Yves Auroy. PUBLIC PERFORMANCE AND SIMULATION: A CASE STUDY IN THE FRENCH MILITARY HEALTH SERVICE. 4ème colloque AIRMAP, "Les nouveaux territoires du management public", AIRMAP (Association Internationale de Recherche en Management Public); IAE Lyon - Université Jean Moulin Lyon 3, May 2015, Lyon, France. hal-01158733

HAL Id: hal-01158733
https://hal.archives-ouvertes.fr/hal-01158733
Submitted on 1 Jun 2015

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PUBLIC PERFORMANCE AND SIMULATION: A CASE STUDY IN THE FRENCH MILITARY HEALTH SERVICE

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ABSTRACT

New public management emphasises the importance of performance for public utilities, in a context of public expenses reduction and increase in health care needs. Recent studies show that existing evaluations of hospital performance fail to assess the complete spectrum of hospital activities.

What are the limits of existing performance indicators? How could we overcome them? An extreme case study, based on French Military Hospitals, is used to answer these issues in the present article. In fact, evaluation of military hospitals’ performance fails to take into account both military and civilian health care delivery.

A simulation of the surgical process of these hospitals shows how incomplete performance indicators happen to misrepresent the impact of specific activities on hospital performance. Simulation is proposed as a lever to generate appropriate performance indicators both for civilian and military hospitals. Finally, hospital performance relevance is questioned with regard to public value.

INTRODUCTION

Public performance measurement requires the evaluation of the cost/value ratio of public utilities (Lorino 1999). Past studies have revealed that public performance evaluation is complex in practice (Keating 2001, Wargo 1995). Moreover, the definition of public performance indicators largely influences public policies. In fact, policies which are not associated with measurable impacts have high risks of not being applied as shown in a report published by the Organisation for Economic Co-operation and Development (2004) (Keating 2001). In a performance-oriented public system, indicators are key elements.

The World Health Organisation (2003) pointed out that hospitals’ multiple tasks make public performance measurement complex for hospitals. A benchmark of acute care revenues and costs is frequently used as an indicator of hospital performance in spite of its limited scope (ENA 2008). Past studies show that specific activities are rarely included in hospital performance analysis.

The case of French military hospitals is emblematic of the limited scope of current performance indicators. These hospitals provide care both inside their structure (contribution to public health service) and outside. In this last case, they provide care to soldiers engaged in military operations. In 2009, the Court of Auditors established that military hospitals lacked efficiency by comparing them to their civilian counterparts. This comparison was made according to classic hospital performance indicators.

The aim of the present paper is to demonstrate that existing performance indicators are limited in scope and that simulation can be a means to generate new performance indicators for both civilian and military hospitals.
This paper is based on a simulation of the surgical process in 3 military hospitals. The results of the simulation question the scope of existing performance indicators.

After presenting actual debates around the notions of public and hospital performance, we explain why we selected a case study in the French military Hospitals to study hospital performance limits. The simulation logic is then presented along with data collection methodology. Finally, the simulation demonstrates the biased impact of defence tasks on performance measures while offering the possibility to create new indicators for hospital performance. We conclude the article by comparing hospital and health system performance and questioning their respective relevance.

THEORETICAL FRAMEWORK

Public performance


Public performance measurement is crucial because it largely influences public policies’ application. Actually, the Organisation for Economic Co-operation and Development (2004) (Keating 2001) demonstrated that policies with non-measurable impacts have high risks of not being applied. However, performance measurability is questioned by data availability: data on impacts of public policies is extremely difficult to collect regularly.

Public performance evaluation entails measuring both public utilities’ contribution to solve collective issues and their efficiency in resource allocation (Knoepfel and Varone 1999). In other words, public performance assessment involves solving two distinct issues:

- Assessing public policies’ effects on population needs
- Evaluating public utilities’ allocation efficiency regarding all resources employed.

Assessing public policies’ effects on population needs is difficult because of exogenous factors’ impact. Thus, public performance indicators are often limited to an evaluation of public utilities production (e.g. number of decisions, beneficiaries). The impact on the population is neglected. Similarly, allocation efficiency measurement is often limited public utilities’ production (Hirtzlin
1999, Knoepfel and Varone 1999). In other words, allocation efficiency is reduced to internal efficiency.

These limitations of public performance measurement are sensible for hospitals but they are not the only elements limiting hospital performance assessment.

**Hospital performance**

Since the 19th century, interest in hospital performance has been growing reaching a high point with the emergence of New Public Management (Kelsey 2001). It is difficult to find a unique definition of the term hospital performance (Champagne and Guisset 2005). As for public performance, hospital performance is defined by two elements:

- Assessing if the hospital achieves appropriate care delivery to its beneficiaries.
- Assessing if human, material and financial resources of the hospital are efficiently used.

Healy and McKee (2002) identify the following tasks for hospitals: care delivery, medical education, research, participation in the global health care system, employment, social role. These elements may vary across countries and hospitals’ statuses.

Recognising hospitals’ task multiplicity, the World Health Organisation (WHO) defines the following dimensions to assess hospital performance: “clinical effectiveness, safety, patient centeredness, production efficiency, staff orientation, responsive governance” (2003) (p.2). Despite increasing recognition of the various dimensions of hospital performance, its current evaluation is centred on acute care and neglects other aspects such as teaching, training and staff health. (Lombrail et al. 1999, Moisdon 2013)

In France, the prospective payment system called T2A is often criticised because it focuses all attention on acute care and limits broader performance evaluation (Varone 2008, De Pouvourville 1998) and fails to take into account organisational constraints (Colasse and Nakhla 2011). Other indicators such as certification also contribute to this tunnel vision of hospital performance (Gardel and Minvielle 2008, Milcent and Dormont 2013, Pouvourville 2009). A comprehensive evaluation of hospital performance appears difficult to formalise (Shaw 2003).

To conclude, hospital performance evaluation encounters the following difficulties:

- Multiplicity of indicators covering partially the scope of hospitals’ tasks
- Difficulty to evaluate the social impacts of the production of the hospital

Modelling value adding processes has been identified as a lever to understand public utilities’ tasks and their efficiency (Lorino 1999). In the present study, we apply this approach to the case study of French Military hospitals.

**Research question:**

Public performance is widely acknowledged as a lever of public utility transformation in « New Public Management ». Nevertheless, establishing complete and relevant indicators of public performance is highly complex.

French military hospitals’ specific tasks question existing indicators of hospital performance. What are the limits of these indicators for military and civilian hospitals? How this case enlightens new ways of evaluating public performance?

**METHODOLOGY**

**Research design**

In order to understand the limit of existing hospital performance indicators, we chose to analyse the impact of different hospital activities on those indicators.

We decided to focus on 2 main activities of French military hospitals: surgery and participation in military operations.

We simulate the impact of the second activity on performance indicators used by the French Court of Auditors.

**Case description and selection**

The French Military Health Service is composed of nine hospitals called « Hôpitaux d’Instruction des Armées » (HIA). These hospitals are in charge of providing appropriate care to military and civilian patients while ensuring military tasks such as external operations. These operations require a surgical team for three to four months. The surgeon, the anaesthetist and the nurses composing the team are in charge of providing care to soldiers on the theatre of operations.

Military hospitals performance has long been evaluated according to their defence tasks by military authorities (2009). This evaluation is now extended to their regular care delivery to civilian patients. The Court of Auditors used, among others, the following hospital performance indicators to evaluate the French Military Health Service:

- Prospective payment revenues by medical full-time equivalent in the hospital
- Average annual number of surgical hospitalisations by surgeon
- Average daily number of surgeries by operating room
Comparing the values of these indicators for civilian and military hospitals, the Court of Auditors declared that military hospitals’ low activity reduces their performance.

However, military hospitals are characterised by their defence tasks which are ensured in addition to civilian hospital activities. Existing performance indicators, focused on acute care, probably fail to take into account defence tasks, among other hospital activities ensured by military or civilian hospitals.

Consequently, the case of French military hospitals, which is extreme, was chosen to test the limits of existing indicators of hospital performance on activities other than acute care.

**Methodology selection**

Surgical care is the first profit and cost centre of hospitals. Thus, the scope of our study is limited to the surgical process: hospital performance is analysed both on defence tasks and surgical care delivery.

Simulation is known as a method for increasing hospital performance and operating theatre organisation in particular (e.g. optimisation of surgery scheduling (Dexter, Macario, and O’Neill 2000, Dexter and Traub 2002). Actually, simulation helps understanding how services organisation and human resources planning impact care delivery (Tucker 1999, Ramis, Palma, and Baesler 2001, Guerriero 2011)).

We have selected this method to analyse the interdependences of surgical and defence activities in military hospitals. If surgical activity is in the scope of existing performance indicators, defence activity and its impact on acute care are not. Simulation helps to understand the limits of existing performance indicators. Simulation also appears as a support to create new ones, larger in scope.

**Data sources**

Understanding both defence tasks and surgical care requires distinct efforts of data collection.

Data collected on surgical activity is the following: working time for medical and paramedical staff and operating room time (i.e. “block time”).

Data collected on defence tasks is working time for medical and paramedical staff in external operations.

**Simulation**

We have established a mathematical model to simulate the surgical process and staff participation in defence tasks. This deterministic simulation is applied in three of the nine military hospitals with a validation based on 20 months of historical data. Correlation rate between outputs of the simulation and historical data is high (respectively 84%, 91% and 94%).
Simulation hypotheses:

- **Scope of the study**: the surgical process and staff participation in external operations are the only activity simulated. In scope human resources are the following: anaesthetist nurses, operating room nurses, anaesthetists and surgeons. The surgical process is simulated and measured through operating room time and utilisation rate.

- **Stability**: health care demand, staff competences and services organisations are considered stable.

- **Homogeneity**: staff competencies and working capabilities are considered as homogeneous in nature and volume.

**Simulation logic**

The number of available working hours in the operating theatre is computed taking into account staff participation in external operations. The simulation computes which staff categories are limiting surgical activity and gives the number of working hours that are not consumed in the operating room for other staff categories. This output helps understand the efficiency of the surgical process while taking into account participation in external operations. Then, utilisation rates and monthly operating room times are computed. These outputs define the production of the operating room, while the working days spent in external operations show the participation to defence tasks.

The following figure details the logic of the simulation.
Impact of military tasks on surgical activity

The simulation is run twice: with and without considering staff participation in external operations. The difference in terms of surgical care production and wasted working hours can be analysed to understand the impact of external operations on acute care delivery and internal hospital efficiency.

RESULTS

Defence tasks’ impact on performance indicators

Surgical activity of French military hospitals happen to be impacted by staff participation in external operations. When human resources required for external operations are also critical resources in the operating room, the surgical activity is reduced. The difference between the surgical activity produced while staff participates in external operations and the surgical activity that would have been made without this participation can be measured thanks to the simulation.

The below figure shows this loss of surgical activity resulting from staff participation in external operations for hospital A:
This impact is variable depending on the volume of external operations, the period of the year and the organisation of the hospital. Balancing the headcounts of staff categories is necessary to the production of surgical care. When participation in external operations is high, critical resources available in the operating room are low and thus surgical activity is reduced. However, low surgical activity is linked to low utilisation of materials and thus poor performance, according to indicators based on acute care measurement like the number of surgeries by operating room. Nevertheless, surgical care reduction is a consequence of military hospitals’ core task, external operations. These operations contribute to military hospitals public performance to a certain extent.

Existing performance indicators mask the link between defence activities and poor efficiency of the surgical process. The human resources disequilibrium created by defence activities explains low efficiency measures for acute care. Existing indicators give a tunnel vision of hospital performance. New indicators are necessary to provide a comprehensive evaluation of military hospitals performance. Civilian hospitals would also benefit from such evaluation as many of their activities are out of scope of existing performance evaluation.

**Performance indicators evolution**

For instance, some of the indicators used by the Court of Auditors in its report should be adapted. Instead of comparing average activity revenues by medical full time equivalent (after subtracting medical working time in external operations), the Court could use average activity revenues simulated with no participation in external operations. This last indicator would have the advantage of taking into account the impact the participation in external operations of paramedical staff on surgical activity. Similar transformation could be made with
the indicator consisting in measuring the annual average number of surgical stays by surgeon.

Here, the idea is to compensate the impact of hospital activities that are outside the scope of existing performance indicators on in scope activities. As a consequence, public performance is not negatively impacted by out of scope hospital activities. Nevertheless, in this case hospital performance would not be positively impacted by these activities whereas they are part of the public service delivered by hospitals.

Nevertheless, the simulation can help build new indicators to measure a component of public performance: internal efficiency. Wasted working time is one of them. It is the ratio between available resources and resources in use (all hospital’s tasks being considered). This indicator of internal efficiency has the advantage of considering internal efficiency on different hospital’s tasks rather than local allocation efficiency on a specific one such as acute care delivery.

A need for comprehensive performance indicators is not specific to military health care organisations. The limits we show on existing indicators are also valid for civilian hospitals. If indicators are limited to acute care, other activities such as education or research are neglected. Our approach, based on simulation, offers an alternative to create indicators of internal allocation efficiency taking into account multiple activities contributing to the public service tasks of hospitals (both civilian and military).

**How public performance can be improved?**

Enlarging the scope of performance indicators thanks to simulation, contributes to higher interest in the different tasks of hospitals. This interest is, in turn, a lever to increase performance.

In addition to this enlightening effect, the simulation can increase performance by facilitating the understanding of the organisation of the hospital. For example, in our case study, simulation helps determining critical resources in the operating room by taking into account both the surgical process and staff participation in external operations. This is essential to develop organizational solutions to increase performance.

Thus the role of simulation in increasing public performance should be studied further, not only for hospitals but for all public utilities. This technique can help identify, understand and formalize public service tasks. This can support organizational innovations to maximize performance by optimizing resources allocation, production processes and output measurement. Simulation can also provide indicators of internal allocation efficiency: measuring resources consumption and output production for each activity. Consequently, simulation, which has been successfully applied in the private sector for more than fifty years (Covès 2000), appears to be a useful tool to evaluate and increase internal performance of public utilities.
However, simulation doesn’t solve the issue of external efficiency measurement: evaluating how the action of the public utility contributes to ameliorate the situation of the population. The United States have considerably improved their military health systems by focusing on indicators of their beneficiaries’ health condition rather than production indicators. The veterans’ health system is now proved as one of the most efficient health care systems (2015) thanks to the focus on global health care performance. In the French military health service, beneficiaries are not captive of military health care providers and often prefer civilian providers (Byrne et al. 2010, Galvin 2005).

Consequently, it appears reasonable to question the limits of the concept of hospital performance.

**DISCUSSION: HOSPITAL PERFORMANCE OR PUBLIC VALUE?**

Hospital performance measurement is emblematic of New Public Management in the health care sector and do not avoid New Public management main limitations: a focus on economic and measurable activities (Alford and Hughes 2008, Pollitt 2003). Our study exemplifies these limits.

Actually activities, such as defence tasks, fail to be accounted for by hospital performance indicators. These indicators can be ameliorated through simulation, as explained earlier, as this tool helps taking into account organisational constraints (Colasse and Nakhla 2011). Nevertheless, we couldn’t produce indicators fully reflecting what military health care providers bring to citizens: expertise, support to nation defence and health care delivery.

More than indicators limits, the problem probably lies in the concept of public performance which requires to measure efficiency precisely. Military hospitals by their specific position, between defence and health care institutions, have a variety of activities which are difficult to measure on the same scale.

Public value which is one of the main concepts used by researchers criticising New Public Management can be used to build strategies in the public sector (Moore 1995) by being the criteria of selection between different options offered to managers (Alford and Hughes 2008). In our case, we could adapt the operating room simulation in order to use it prospectively. We could test different scenarios with less or more participation in defence tasks. Public managers’ evaluation of public value would probably benefit from this analytic approach (Moore 1995).

Our study shows that simulation can help public managers to understand the complexity of public utilities activities. This can be used to evaluate their performance according to new management standard. Nevertheless, simulation can also help public managers to go beyond the limitations of new public management by appreciating the public value of their policies.
CONCLUSION

Public performance assessment is often limited in scope. Our contribution uses simulation of public utilities’ activity as a mean to develop new indicators of public performance. These indicators can take into account multiple activities contributing to public utilities’ tasks and their interdependencies. This technique, successfully used in enterprises, could be used more often as a performance levier in public management. Our case study showed that it was both a good tool to create comprehensive performance indicators and to increase performance in hospitals. Finally, evaluating the contribution of hospitals to public value appears as the next step of public management. Simulation could reveal to be an effective analytical tool in this case too.
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