Capacity Planning at a Tactical Level in Hospital Departments

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Abstract: The purpose is to describe the essential components and output of the tactical planning process and to explore context-related variations in the applicability of the planning process for hospital departments. The paper is based on a multiple-case study of three hospital departments' planning processes at a tactical level, wherein the department manager's[1] support of the planning process was found to be essential. This study illustrates how an active tactical planning process can provide for numerous potential measures to adjust capacity and how they may vary in different contexts. An active tactical planning process provides the ability to move from current short-term, costly fire-fighting measures to more proactive capacity adjustments within hospital departments, which allow the department to stay under budget while keeping waiting times and queues within limits.

Keywords: Capacity planning, Healthcare, Tactical level, Planning process

1 Introduction

Over the years, capacity management challenges of healthcare organizations [7, 8] have been reported in England [e.g., 2], Holland [e.g., 3, 4], Australia, Canada, England, New Zealand, Wales and Belgium [5, 6]. Silvester and Lendon [2] suggest that these challenges should be met by more accurate match between demand and supply of resources. The matching between resource supply and demand is made in the organizations' capacity planning processes, where tactical-level planning dictates how operational-level matching is accomplished. Several authors (i.e., Larsson and Johansson [9], Roth and van Dierdonk [10] and Hand et al. [4]) report on operational challenges due to insufficient planning at the tactical level. As a result, high-resource utilization and long wait times for some patient groups are dealt with through "fire-fighting" measures, such as engaging costly excess resources [4]. These issues illustrate the need for increased tactical capacity planning within healthcare organizations.

Previous research regarding capacity management within hospital departments has focused on operational planning level [e.g., 11, 12-14], such as the patient mix [14] or scheduling practices [12]. Literature that deals with the managerial aspect of the hospital planning process mainly presents planning and control frameworks that structures all planning levels [e.g., 3, 4, 8]). However, these studies do not describe the step-by-step planning process to assist hospital managers in matching the supply of resources with the demand for resources. There remains a need for understanding how to balance supply and demand in the tactical planning process within hospital departments. Thus, the purpose of this paper is to *describe what components and output of the tactical planning process are essential and to explore context-related variations in the applicability of the planning process for hospital departments.* The study is based on the tactical planning process within three hospital departments at a Swedish University hospital. The study will contribute to the understanding of tactical capacity planning by studying the required input, activities performed, measures used to adjust capacity and demand and the desired output within these three cases.

2 Theoretical Framework

This section will answer to the first part of the purpose stated above. It presents the included components of the planning process and the content of each component. A descriptive summary of theoretical planning process is stated at the en of the section, Table 1.

Production planning is often described as a hierarchal structure of processes, at the *strategic*, *tactical* and *operational* levels [8, 10, 13, 15]. Planning processes on the tactical level are the sales and operations planning (S&OP)

[1] The department manager is responsible for the provision of hospital specialty care. In this paper, the relevant individuals manage the Urology, Cardiology and Psychiatry (affectionate disorders) departments.

process and the master production schedule (MPS) process [16]. In some organizations, S&OP and MPS are not separated into two different processes, but are called Master Planning [16, 17]. The responsibility for the tactical planning in hospital lies on the middle managers, however, it sometimes relies on interaction with top management [3].

The tactical planning process consists of different activities, including estimating the demand for products or services, deciding on a preliminary delivery plan and generating a preliminary master production schedule, reconciliation of plans and conditions and adaption of plans, as needed [17, 18]. When the demand and supply of capacity is balanced, the next step is to settle the prepared plans. The task of reconciling plans and conditions, and focus of this paper, is capacity planning, which at this planning level is often referred to as a rough-cut capacity plan (RCCP) [19], in which the anticipated capacity variations are included [2]. According to the works of Tavares Thomé, Scavarda [16], the planning processes can be divided into the following four parts: the planning process structure and activities, planning process input, measures that are available for balancing demand and supply, and the process delivery output.

Structure and Activities: The form in which a planning process is performed can be described as the structure and activities [16], which is denoted as managerial aspects consisting of meetings, activities and methods used to analyze data. The meetings can be characterized by the frequency and participants of meetings [16, 19]. The planning object at the tactical level is a product or service group. The planning horizon may vary between organizations, depending on product or service lead-times [18] and may span from less than six months to over 18 months [16]. The frequency of tactical planning is usually monthly or quarterly [17].

The activities of capacity planning are described by Jonsson and Mattsson [17] as calculating required and available capacity, performing capacity adjustments and making alternative actions. The manner in which data is analyzed and combined varies among organizations. Advanced IT system spreadsheets or mathematical models are analytical tools used to support capacity planning, where even the simplest method may be sufficient to fill its purpose [20]. Present methods and calculations models can roughly be described as either focusing on how to utilize resources in an effective way [14] or how to re-design resources to create a better flow of patients through the resources [e.g., 21, 22]. Furthermore, literature presents different kinds of tools supporting the decision-making in the capacity planning process [e.g., 11, 21, 22, 23].

Input: Input to the capacity planning process is necessary to determine future needs, such as demand, available resources, restrictions placed on the system, targets and to what extent production will be allowed to deviate from plans. Information about the future demand in hospitals should be unconstrained [19] and should describe the variations [2, 3]. Future demand consists of both known and unknown demand [4]. The unknown demand is forecasted demand, often based on historical data, whereas known demand includes waiting list information and "downstream" demand of patients currently under treatment [4]. Demand variation in healthcare is to be found both in volume [23, 24] and mix of resource requirements [14, 22]. Furthermore, the urgency and patient-throughput time create variations regarding the required timing of resource supply. Input regarding hospital capacity generally consist of the following resources: facilities, workforce and equipment [13]. Resource properties influence the available capacity (i.e., whether a resource is multifunctional [15] or specialized, if the resource is cost-intensive, resource availability [3] and if the resource is a shared resource or a dedicated resource [3, 14]). The available capacity is often formulated in terms of available hours and number of entities.

Tactical-level planning is restricted by decisions made at the strategic level and the feasibility of options at the operational level [14]. Strategic decisions may include the available number of units or time at the units. Other restrictions may be financial, such as budgeting or if the hospital is operating in a contracting market under planning restrictions [3]. Planning targets are formulated in terms of patient through-put (time, volume) [14], patient waiting time, length of waiting lists, resource utilization rate [14], production costs [15] or level of bed occupancy [21], etc. As input to the planning process, tolerance levels may also be provided.

Measures: Measures taken to balance demand and supply include adjustments to both the demand side and the supply side [25]. In the healthcare setting, measures adjusting capacity involve decisions concerning the acquisition and allocation of three types of resources: work force, equipment and facilities [7, 23]. A resource acquisition at the tactical level involves, for example, decisions concerning work force changes, overtime and subcontracting [7, 25], as well as the use of innovative shift schedules and employee cross-training to allow for movement between units [24]. Measures used to adjust patient demand is include prioritizing patients according to medical condition, re-scheduling, building queues, admissions planning and using scheduling rules [14].

Output: According to Tenhiälä [26], the primary objective of capacity planning is to ensure the feasibility of production plans. Besides the production plan per se, the output should link lower planning levels with higher by providing feedback regarding tactical plan feasibility, which helps improve hospital management performance [1] and the effectiveness and efficiency of healthcare delivery [4]. Linking the lower planning levels to the higher results in changing the role of managers from one that is reactive to one that is more pro-active [1].

Table 1 Summary of analytical framework based on theory

Structure and Activities	Input	Measures	Output
Meetings Frequency Participants Planning horizon Planning object **Activities** Calculate available and required capacity Compare available capacity with required capacity Choose suitable measure/-s considering targets Adapt the delivery plan and/or the production plan Establish delivery plan, production plan and actions taken at the tolerance levels **Analytical methods** Spreadsheet IT system support Mathematical models	**Future demand** Production plan based on: Unconstrained and consensus-based forecast Downstream demand Backlog/waiting lists **Available capacity** RCCP – including anticipated capacity cut downs (e.g. further training of staff) **Restrictions** Budget (available funding) Strategic planning Operational constrains **Targets** Through-put (time and volume) Waiting time Length of waiting lists Resources utilization Costs (change in budget) **Tolerance levels**	**Capacity adjustments** Overtime Extra staff Sub-suppliers, i.e. Buy care from other health care provider Moving capacity Cross-training **Demand adjustments** Medical priority Re-scheduling Building queues Admissions planning Scheduling rules	**Feasible production plan** **Feedback** To upper planning level To the next round of planning

3 Methodology

The authors of this paper selected an exploratory multiple-case research design to explain the phenomenon under investigation. The research started with constructing an analysis framework of the capacity planning at the tactical level based on existing literature [27]. The analytical framework was built on literature from both the healthcare and manufacturing domains; thereby forming a foundation of previously developed theoretical frameworks on which to build this study [16, 20], while systematically verifying their applicability in a new setting. The data collection was made through semi-structured interviews. An interview guide based on the analytical framework was used [28]. The studied departments were selected based on their differences in service, demand and manufacturing processes, which were chosen to obtain a wider understanding of the tactical capacity planning process within different contexts. The data collection focused on identifying the main structure and activities, input, output and measures used in the tactical capacity planning process at the studied departments. A cross-case analysis was performed to compare the ways that tactical capacity planning was conducted in the cases.

4 Empirical Data

4.1 Cardiology

Approximately 40 physicians, 250 nurses and administrative staff in the Cardiology department treat an average of 16,900 outpatients and 6,000 inpatients each year. The department consists of three wards, six laboratories, an outpatient policlinic, divisions that treat heart problems and patients undergoing smoking cessation as well as a teaching unit.

Structure and Activities: There is no set planning process structure, and the focus is on costs. As such, the frequency of meetings follows the yearly budget process. The planning of available resources is not synchronized with the yearly production planning, rather the status of consumed financial means is controlled on a monthly basis, and the staff is scheduled on a quarterly basis. As a result, there is minimal connection between demand and available resources, as there is a continuous inflow of patients with treatment processes measured in days and weeks. Meeting participants represent all relevant parties for the treatment processes and financial and organizational units, including the department[2] manager, the unit[3] managers, the section[4] manager, operational developer,[5] accountant and human resources representative. During

[2] The department manager is responsible for the provision of hospital specialty care (e.g., Cardiology, Urology and Psychiatry. Psychiatry, which in this case includes affectionate disorders.)

[3] The unit being an organisational part of the production system, such as a ward unit or a clinic

[4] The section is a subdivision according to speciality of care within the department, defined by the competence of the physicians

[5] The hospital's support function for improving the production performance of the hospital

planning, patient groups are formed according to their resource requirements, and spreadsheets facilitate the understanding of required and available capacity; however, spreadsheets are not used for all patient groups.

Input: The anticipated demand and allocation of capacity between patient groups are based on the previous year's outcome. Data regarding patient demand and available capacity is, to some extent, available in the IT systems but is not systematically used. For example, the waiting lists are recorded and viewed by the manager, but are not used during the planning process by including the backlog in the demand. Restrictions are formulated in financial terms as limits where new funding is required and as patient waiting times. The limit is used to notify upper organizational levels that the budget is insufficient. Patient waiting times are measured but are not actively used in the planning process; rather, the patient waiting time restriction is used to depict when patients are redirected to costly sub-contractors. The objectives of the planning process are to achieve the performance measures, patient waiting time and delivered number of patients and medical priority of patients. The tolerance levels are expressed by the department as patient waiting time but, when interpreting the priority of planning focus, one could suggest that they also have indirect tolerance levels regarding costs.

Measures: The measures taken to balance demand and supply adjust capacity by utilizing extra staff, approving overtime, and using sub-suppliers and cross training. Demand is adjusted by building queues, prioritizing patients according to medical condition and re-scheduling patients. Moving capacity between points of use (e.g., relocating surgery equipment between operating rooms) is rarely used as a measure of adjusting capacity because each department's equipment is typically stationary and requires specialized staffing. However, relocating resources does occur with some nurses and physicians when the required competence is the same. The admission planning and scheduling rules are not used due to the large number of emergency patients.

Output: The output of the existing planning process is not a production plan, but rather a set of recommendations regarding what to produce. Existing planning activities provide feedback to the strategic level regarding the consumption of the budget and what the production process has achieved to deliver.

4.2 Urology

The Urology department treats approximately 22,000 patients each year and performs about 1,300 inpatient and 5,000 polyclinic operations, with the largest patient group being cancer patients. The department comprises two ward units and one outpatient clinic, which consists of eight nurse receptions, each one specializing in distinct specialties, such as prostate cancer, colostomy, kidney cancer or kidney stones.

Structure and Activities: Planning process activities include calculation of available and required capacity, comparison of available capacity and required capacity, establishing measures to adjust the two, adaption of a production plan and establishing the production plan. The activities are treated at the monthly planning meetings. The planning process is heavily dependent on the department manager and a spreadsheet-based planning tool supports the planning. The established plan is locked for changes 3-5 weeks ahead, with built-in slack for emergency patients. The planning process is divided into two separate parts: clinic planning and surgery and wards (inpatient) planning. The reason for combining the surgery and wards planning is the strong dependency between surgery and wards. However, the separation between clinic and inpatient planning make the planning of the inpatient treatment process fragmented by decoupling one patient's clinical treatment from the inpatient part of the treatment. The planning meetings include department manager,[6] unit managers[7] and administrator[8]. The planning horizon is a 12-month rolling period that bridges the budget year. The planning objective is to form patient groups for the two separate planning processes that are quantified differently. At the surgery unit, the resource requirements of the patient groups are measured in multiples of required surgery time (minutes), while the requirements at the ward unit are measured in days (or sometimes in beds). Clinical planning focuses on patient groups and the required number of visits (one patient one visit, and days include a number of visits), allowing adjusting resources according to the varying requirements of a specific patient group.

Input: The department makes use of available data from the IT systems regarding patient demand. Demand is forecast by factoring the amount of demand met during the previous year (hospital days, number of visits and discharges) and patient waiting lists. The forecast is adjusted with tacit knowledge, such as experience and other relevant information. The number of referrals is not directly used in the planning due to the department's ability to admit all referred patients at the clinic within a reasonable time.

Available capacity is estimated based on previously used capacity (i.e., the volume of capacity that each treatment unit (e.g., lab or surgery) provided last year. This method is preferable due to generally small changes in staff, facil-

[6] See footnote 2
[7] See footnote 3
[8] Staff with insight into the historic data of the department

ities and equipment. Capacity is measured in the same way as demand (i.e., number of patients per patient group, days at the ward or surgery unit, visits). Restrictions on the planning process are derived from strategic decisions made by hospital management and factor in the allocated budget and the maximum patient waiting time for new and return visits. The strategic decisions are also used to formulate targets for the production system, such as patient waiting time for new and return visits and the yearly number of surgeries. Other targets are to prioritize patients according to medical priority and to treat critical conditions within an adequate timeframe.

Measures: Measures taken for capacity adjustments include the following: overtime and moving workforce and ambulatory equipment. In general, there is a lack of urologists in Sweden; therefore, overtime at evening clinics is frequently used. The department manager has limited authority to make changes outside of the budget and, when required changes are outside his authority, they are passed higher up in the hierarchy. Measures taken to adjust the demand to better fit the capacity abide by scheduling rules. The surgery unit is perceived as the bottleneck of the production system, and the purpose of using scheduling rules is to make better use of available capacity at the surgery unit. Medical priority is not articulated as a measure to adjust demand. However, dedicating slack time to treating emergency patients can indirectly prioritize urgent medical conditions. While queues and admissions planning are not intentionally used, queue length varies as a natural consequence of patient inflow.

Output: The output of the planning process is actively used to create production support on both a weekly and monthly basis. The feedback the planning process provides is regarding insufficient capacity and how well the system produces according to targets.

4.3 Psychiatry

The studied Psychiatry department specializes in affective disorders and is comprised of nine outpatient clinics at different geographic locations with varying specializations. The department also consists of five ward units for inpatient care and one unit for research and teaching.

Structure and Activities: Planning activities include estimating the required and available capacity, comparing the two types of capacity and choosing suitable measures that will adjust the balance, thereby establishing a production plan. First, the forecast from the previous planning period is evaluated and compared with the outcome (i.e., number of referrals, accepted referrals, first visits, return visits and discharges). The meeting also includes follow-ups on tasks discussed during the previous meeting. Second, production plans for each clinic are established, and then combined into an overall plan for the whole department. Third, capacity and demand adjustments are made within or between clinics, if needed. Fourth, the plan is frozen one month prior to the planning meeting, with changes allowed only when forecasted patient waiting times exceed three months. The department manager, unit managers, administrator,[9] and operational developer[10] take part in the monthly meetings. The planning objective is patient visits over a rolling 12-month planning horizon. The majority of the treatment process is based on visits, with the exception of an inpatient resource demand of beds and the rare need for radiology equipment. New visits are given priority over return visits because this is the politically stated performance measure used. Spreadsheets are used to support planning and to control production.

Input: Demand input consists of data from the patient process at an aggregated level: total number of incoming patients, total number of visits and discharges. The available capacity is the number of employees and their competence. According to hospital management, each treating staff member (e.g., psychiatrist or therapist) is expected to provide 800 hours of patient treatment time per year, which is less than 50% of full-time employment. How the number of patients in the production system translates into capacity requirements is not known and is thereby not used as input when planning.

The expressed restrictions are the allocated budget; however, there are also capacity adjustment restrictions (i.e., the possibility of hiring additional staff members). Targets of the capacity planning process are the length of patient waiting time, the number of new visits and the number of discharged patients. All of the targets are related to performance measures by which the production is evaluated. The tolerance level and targets are formulated according to the number of new visits and maximum patient waiting time.

Measures: Measures used for adjusting the capacity of the production system include overtime and moving capacity. The movement of capacity is usually in the form of physicians and psychiatrists, while nursing staff is seldom moved. Measures for adjusting demand include admissions planning and rescheduling. Admissions planning is accomplished by redirecting referrals between units that have equal supplies of competence, with a goal of balancing the numbers of new and return visits. To adjust the demand to meet capacity, the frequency of visits is decreased from four visits per month

[9] Staff with insight into the historic data of the department
[10] Hospital support function for improving the production performance of the hospital

to three visits. However, when the treatment process becomes ineffective due to scarce visits with the therapist, a frequency limit must be considered when scheduling patients' return visits. Patients may also be rescheduled to alternative, similar treatment resources. Lastly, the department also adjusts the demand for resources by reducing the number of patients in the production system.

Output: The output of the planning process is a monthly production plan for all eight clinics, providing planning support on two levels: the individual clinic production and the total amount of psychiatric care production for the hospital region. The output of the planning process also provides feedback regarding the forecast accuracy, which is invaluable for strategic planning by hospital management. Feedback is made by signaling when production is about to violate the tolerance levels for maximum patient waiting time. In this case, tolerance levels are formulated according to how many visits are required to reach the target of maximum patient waiting time, rather than being based on patient throughput time or the number of patients that must be re-booked due to lack of capacity.

5 Analysis

Table 2 Cross-case analysis of planning processes at Cardiology, Urology and Psychiatry departments

Structure and Activities	Cardiology	Urology	Psychia-try	Cross-Case Analysis
Structured capacity planning process	No	Yes	Yes	There is no hospital wide standardized planning when it comes to structure and activities, which forces the department managers to form the process themselves. In the **Cardiology** department the capacity planning process is under development and, therefore, not used as a tool for pro-active actions. The **Psychiatry** department is starting to make use of the planning process for better balance between supply and demand. However, lack of relevant data (e.g., proper patient care plans) complicates the planning and evaluation of production outcome. The **Urology** planning process is actively used to plan and control department operations; however, there are still potential for improvements when bureaucracy delays the timing of proper measures.
Frequency of meetings	Yearly (Quarterly)	Monthly	Monthly	The frequency of **Urology** and **Psychiatry** department meetings is similar to the frequency of theory, but not for **Cardiology,** for which there are fewer opportunities to react to changes due to infrequent planning meetings. The scheduling of staff is made quarterly.
Meeting participants	Cross-functional	Cross-functional	Cross-functional	**All three departments** use a cross-functional process in which meeting participants include a department manager, unit and section (when applicable) managers, and a representative providing data. Since the **Cardiology** department planning meeting is mainly a budget meeting, the human resource representative and the economist are also present. The **Cardiology** and **Psychiatry** departments are both developing their capacity planning processes and, therefore, include a planning support function at the meetings.
Planning horizon	Year	Rolling year	Rolling year	**All three departments** have a planning horizon of 12 months. However, the **Urology** and **Psychiatry** departments utilize a rolling horizon, which results in static planning perspective, while the **Cardiology** department's planning horizon decreases during the fiscal year.
Planning object	Some pat groups	Pat groups	Total amount of visits	The focus on patient groups makes it possible for the **Urology** department to adjust resources according to the varying requirements. However, in the **Psychiatry** department, all patients are aggregated and the focus lies on the total number of new and return visits, which has led to the inability of capacity planning to provide improvements for specific patients groups. The **Cardiology** department has been better able to provide appropriate care since it began to focus on the number of visits to patient groups. Planning based on patient groups is not currently utilized for all patient groups but is a first step in creating a capacity planning process.
Activities	No	Yes	Yes	Since **Cardiology** has only one yearly meeting with random check-ups during the year, it has little knowledge of the performance of the production system during the year. **Urology** is the most updated of current state among the departments and controls the production through its planning activities and adjustments of activities according to capacity and demand. **Psychiatry** has a functioning system of activities but requires better input to improve planning performance.
Analytical methods	Partly	Yes	Yes	**For all three departments**, simple comparisons of numbers in Excel are the only analytical method used; there is no use of optimization calculations The use of spreadsheets is probably suitable for its purpose. Generally, the available data has a low level of detail, which reduces the potential for the exploitation of a more sophisticated planning tool.
Input				
Future demand	Historical data	Historical data and tacit knowledge	Historical data	**All three departments** use the historical data of treated patients as forecasts, but use the data differently. Since the department treats all referred patients, **Urology** forecasts demand using historical data and adding tacit adjustments when it is needed. **Psychiatry** forecasts demand using historical data, but does not know how to interpret the number of patients as resource requirements due to undefined patient care processes. **Cardiology** uses the data as forecasts but is unaware how it corresponds to the actual patient demand and whether it has changed.
Available capacity	Yes	Yes	No	**All three departments** estimate capacity based on the previous year. This method is consciously chosen for **Urology** since there is little variation in staff, equipment and facilities between years. **Cardiology** strictly uses the data from previous year out of tradition. **Psychiatry** has no active way of measuring capacity and uses the performance of the previous year as guidance, without making adjustments. **Psychiatry** uses capacity levels garnered from hospital management, which is based on negotiations between management and staff representatives rather than time measures and treatment plans.

Structure and Activities	Cardiology	Urology	Psychia-try	Cross-Case Analysis
Restrictions	Yes	Yes	Yes	Budget is a restriction used by **all three departments**. In addition, **Cardiology** and **Urology** use patient waiting time as a restriction. In the **Psychiatry** department, the patient waiting time is classified as a target. For the departments that use patient waiting time as restriction, the waiting time is also used as target.
Targets	Yes	Yes	Yes	Department targets (e.g., patient waiting time, number of visits or number of discharges) are generally formulated according to the KPIs (key performance indexes) by which the production is evaluated. The targets are also formulated in efficiency terms (i.e., number of patients delivered for a certain amount of money and number of surgeries per year).
Tolerance levels	Yes	Yes	Yes	At both **Cardiology** and **Urology**, the department manager oversees that production delivers within tolerance levels and according to targets. In the case of **Psychiatry**, tolerance levels are set by and supervised by hospital management. Thereafter, hospital management provides feedback on production performance.
Measures				
Capacity adjustments	Yes	Yes, focus	Yes, limited	Capacity measures made by **Cardiology** focus on using extra resources (e.g., sub-suppliers and extra staff), and adjustments made within current resources are by via cross-training and overtime usage. **Urology** focuses on adjusting capacity according to demand. The adjustments are made within current resources with no addition of sub-suppliers or extra staff. **Psychiatry** adjusts both demand and capacity whenever possible. Capacity adjustments for Psychiatry are, however, limited by the supply of qualified staff and regulations of hiring temporary psychiatrists.
Demand adjustments	Yes	Yes, minor	Yes	**Urology** has created measures on the demand side to schedule surgeries and better utilize the operation theatre. While the **Urology** department focuses on capacity measures, the **Cardiology** department makes increased use of demand measures as well as **Psychiatry,** which focuses on making adjustments at the demand side.
Output				
Feasible production plan	Recommen-dation	MP	MP	**Cardiology** does not use a planning process to obtain a feasible production plan. The scarce output of planning is a recommendation for next year's production. The planning processes of both Urology and Psychiatry provide a feasible master production plan. For the **Psychiatry** department, the plan is given on two levels.
Feedback	Yes	Yes	Yes	The feedback that **Cardiology** is utilizing for planning is the status on consumed budget. **Urology** frequently uses the planning process for continuous feedback on production performance, which is used in the next round of planning. The feedback of the **Psychiatry** planning process is based on patient waiting time and delivered to upper hospital management. The planning process also provides the manager with feedback on forecast accuracy.

6 Discussion and conclusions

The purpose of this paper is to describe the essential components and output of the tactical planning process and to explore context-related variations in relation to the applicability of the planning process for hospital departments. The components and the output that this study has identified are summarized in Table 1. Regarding the context related variation, presented in Table 2, the devotion of the manager was superior for the performance of the planning process. It was foremost decisive of the activities performed, the frequency of meetings, the planning targets and tolerance levels, the choice of measures and the use of the planning process output. The planning process at the Urology department showed to be the most developed process, followed by the Psychiatry department and Cardiology. Urology shows a pro-active planning process, which focuses on providing the most care with the given capacity. The planning object is patient-groups but complements with an overall target of total number of visits and surgeries. Compared to Psychiatry, which also measure total number of visits, the Urology planning process are able to proactively provide measures for patients groups when required while the Psychiatry planning process is dull in its measures with its overall number of visits. The planning at the Cardiology department has improved by introducing patient groups as planning object.

Context related variations regarding the process input were evident in the available data at the Psychiatry department. There were no care plans specified for patient groups and the IT systems were lacking relevant data. Deficient input on required capacity and limited options for adjusting capacity resulted in a re-active capacity planning, with focus on demand adjustments. The cost intense production system of Cardiology along with the immature planning process has lead to a planning process that is more of a budget tool than a support system, where the output is a budget consumption indicator. The way Psychiatry uses the process output enlarge the utility planning process output, from providing production plans and feedback on tolerance levels to include evaluation of previously made forecasts.

This study illustrates the possibilities that an active tactical planning process can provide regarding the number of possible measures to adjust capacity. An active tactical planning process enables the potential to move away from the current short-term, costly fire-fighting measures to a more proactive manner of capacity adjustments within hospital departments that allow the department to maintain the budget while keeping waiting times and queues within limits and, perhaps, shortened.

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