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Operating room staffing and case scheduling

[Click here](#) for the comprehensive bibliography of OR management articles. I have published more than 300 papers in the field and have applied the statistical methods at more than 150 facilities.

Service-specific operating room staffing and operational assessment

E-mail is used to learn about the characteristics of the OR information system data, anesthesia information management system data, or anesthesia billing data. Based on responses, an Excel file is customized into which the data are imported. The following analyses are performed:

1. OR staffing (i.e., allocations) that maximize OR efficiency, for each surgical service [specialty, group, and/or surgeon]. OR efficiency considers not just under-utilized OR time (i.e., utilization), but also the higher cost of planning too little OR time resulting in staff having to work late
 2. Analysis includes calculation of each service's OR workload
 3. Analysis includes estimation of the reduction in cost and increase in productivity that your facility can achieve from service-specific OR staffing based on maximizing OR efficiency
 4. Analysis includes comparison of turnover times to benchmark facilities and among services, assessment of variation in prolonged turnover times by time of the day, and estimation of the impact of reducing turnover times and delays on staffing costs and surgeon waiting
 5. Analysis includes a comparison of cancellation rates by service, as cancellations on or just before the day of surgery influence staffing
 6. Analysis includes assessment of bias in scheduled case durations, as it influences staffing
 7. Analysis includes Bayesian methods for case duration prediction (e.g., to reduce over-utilized OR time by filling holes in OR schedule and reducing equipment conflicts)
8. OR staffing for late afternoons and evenings to minimize staffing costs (e.g., ten ORs to 3 PM, seven ORs to 5 PM, two ORs to 7 PM, and one OR after that)
 9. Analysis includes a comparison of this staffing solution to that obtained using the traditional, albeit inaccurate, approach of staffing for the mean number of cases at each time of day
 10. Analysis includes reports providing late working anesthesia providers realistic end times
11. OR staffing for weekends and holidays to minimize staffing costs, while managing your risk of being unable to provide prompt patient care
 12. Analysis includes an assessment of the combination of staff on-call from home versus on-call in-house in order to minimize staffing costs
13. Surgeon waiting from scheduled start times, both first cases of the day and later in the day
14. Optimal patient ready times on day of surgery to prevent delays and unnecessary waiting
15. Surgeon number of eight-hour blocks per 2 weeks that match the service-specific staffing
16. Long-term estimated workload and capacity requirements

[Click here](#) for a sample Acrobat (PDF) report. [Click here](#) for a lecture describing analyses 1-3 and [click here](#) for a lecture describing analyses 8-9.

A report is e-mailed as a PDF file. A written summary of the interpretation of each page of the report is included in the e-mail ([click here](#) for explanation). Alternatively, the report is summarized during a web conference lasting approximately 1.5 hours. The University charges \$4250 for these analyses.

When anesthesia information system or billing data are used, specialty is used as the service (e.g., in analyses 1-2). When calculations are being done for purposes of an anesthesia agreement, the dollar value from analysis 3 is reported per \$100,000, for use with national survey data (e.g., MGMA).

Decision making shortly before and on the day of surgery

The preceding calculations are sufficient for analysts to implement changes in staffing and case scheduling. A range of stakeholders (e.g., surgeons, anesthesiologists, and nurses) may want to understand the implications of changes in how OR time is allocated, staffing is planned, and cases are scheduled. Adapted scenarios showing best practices in OR decision-making are easy to follow. These best practices are described in terms of the ordered priorities (i.e., business model) underlying the mathematics used above. The ordered priorities themselves are the scheduling guidelines, moving case guidelines, and so forth, of the facility. [Click here](#) for a lecture and [click here](#) for paper. Use of the common set of ordered priorities supports consistency of decision-making. A summary of these ordered priorities is on the last page of this file, along with examples of adapted scenarios.

Topics covered in the adapted scenarios include the following items:

- [Definitions of OR management](#) terms using scientific literature (e.g., what is “turnover time”?)
- Scheduling add-on cases
- Allocating and scheduling an urgent / flexible / open OR
- Moving cases from one OR to another on the day of surgery
- Day of surgery decisions (e.g., what OR should I start first?)
- Scheduling delays between cases
- Scheduling elective cases into ORs to maximize OR efficiency
- Time up to when elective cases can be scheduled
- Releasing OR time allocated based on OR efficiency
- Allocating OR time to maximize OR efficiency
- Incorporating qualitative data in allocating OR time (e.g., expected maternity leave)
- Allocating OR time for surgeons performing few cases
- Staff budgeting linked to OR allocations and staffing

Approximately 45 scenarios are written using the data sent for the staffing analyses. The scenarios contain your physicians' names, OR numbers, scheduled start times, holidays, etc. The resulting table of contents, explanations for each of the above topics, adapted scenarios, and bibliography serve as the revised OR policy manual.

The scenarios are sent as a PDF file setup with protection for a needs assessment of changes in OR decision-making. A few OR managers, schedulers, and clinicians review each scenario to determine whether it matches current practice. Scenarios matching current practice are deleted. In less than one hour, the small set (e.g., 3 to 5) of remaining scenarios show changes necessary to achieve the maximum possible increase in OR efficiency. The remaining scenarios themselves are the customized materials for obtaining information from organizational stakeholders needed to decide on how best to implement changes.

The University charges \$4000 for the adapted scenarios. The educational materials provided remain copyrighted by Franklin Dexter. Permission is granted for reproduction and distribution of them at the facility, provided that the copyright is displayed, there is no commercial redistribution, and the materials are not posted in whole or in part on any Internet (i.e., public, not Intranet) web site.

On-going assessment of staffing, operations, and decision-making

OR allocations are generally reassessed every four months. Training in interpreting the results of the analyses is updated each period during a web conference. The University charges \$3750 to repeat the staffing and operational analyses. Outsourcing the on-going analysis can help physicians

appreciate that decisions are data-driven, and not biased by informal, local, agreements. The most advanced scientifically sound methodology is being applied to your organization to keep your ORs as efficient as possible. In addition, internal analysts do not need to purchase the software, maintain the software, retain skills in using it even though it may only be three times a year, nor follow the scientific literature to update their knowledge.

Meetings and presentations on-site

The service-specific staffing analyses and scenario creation can be performed off-site, with explanation provided by web conference. Some organizations prefer an on-site visit.

- Example of trip to assess anesthesia staffing and plan implementation of improvements

½ day	Preparation	Arrange travel plans Phone meeting and e-mail to arrange presentation objectives and printing of lecture handouts from the results of the staffing analyses Prepare presentation and review with a few managers ahead of time
1 day	Day #1	Travel, during which complete preparation Evening presentation of results with anesthesia providers
1 day	Day #2	2 hr meetings with administrators about results and implementation 2 hr meetings with analysts on information system implementation 2 hr meetings with OR and PACU nursing director and managers 2 hr evening meeting with anesthesia providers and administrators
1 day	Day #3	Travel, during which prepare assessment of anesthesia services Finish recommendations on how organization of anesthesia services could potentially foster surgical growth, and send within 4 days.

The University would charge \$8,750 for the 3.5 days of Dr. Dexter's time, plus travel expenses.

- Example of 3½ day trip for detailed instruction on how to apply best practices in OR management to decision-making at your surgical suite, using the analyses and scenarios created with your data

1 day	Preparation	Arrange travel plans Phone meeting to arrange presentation order, type of conference room, audiovisual equipment, and printing of handouts Prepare initial course and presentations from customized scenarios Extensive web conference to review presentation with 1-2 manager(s) who have helped with analyses and scenario generation
½ day	Day #1	Complete preparation while traveling
1 day	Day #2	7 hr course, organized as: 2 hr, 15 min break, 2 hr, 45 min lunch, 2 hr. 2 hr discussion with participants on implementation plans including data transfer on a routine basis and desired reports
½ day	Day #3	Meet with individual administrators and physicians to review the specific topic(s) of concern to each
½ day	Day #3	Return home. While traveling, prepare e-mail with follow-up information requested by attendees.

The University would charge \$8750 for the 3.5 days of Dr. Dexter's time plus travel expenses.

Ordered Priorities Used in the Needs Assessment of Operational Decision-Making

1. Patient **safety** and quality of care are preeminent
 - Physicians' preoperative assessment, appropriate documentation, wrong site surgery, prevention, etc.
 - Every clinical deadline should be satisfied, regardless of the resulting workload.
 - Cases are only moved/ added if able to ensure clinical safety and quality.
2. **Access** – Every surgeon has open access for cases on any future workday, provided they can be done safely
 - This principle promotes flexibility and growth of the surgeons' practices.
 - Cases can be scheduled to end after 3 PM, 5 PM, etc. The limit to case booking is safety, not an arbitrary time of day.
 - Only one service is allocated each OR on each workday, so that the service is not limited in scheduling its cases.
 - "Service" refers in this context to the surgeon, surgical group, surgical practice, or specialty allocated OR time
3. Operating room **efficiency**
 - On the day of surgery, efficiency means moving cases to minimize the hours of cases performed after 3 PM (or 5 PM, etc.)
 - Service-specific staffing is calculated to maximize expected OR efficiency. Services performing many hours of cases on each day of the week get allocated OR time for that day of the week, calculated using appropriate statistical methods.
 - Cases are scheduled to maximize OR efficiency, if the more important principles of Safety and Access are satisfied. For example, a case is not scheduled to be completed after 3 PM if the service has another allocated OR permitting the case to finish earlier.
 - OR time is released only when a service has filled its allocated OR time and has another case to schedule. Then, the case is scheduled into the OR time of the service with the most allocated but unscheduled OR time.
4. Patient service – Reducing **patient waiting time** on the day of surgery
 - For elective cases, this means reducing patient waiting past scheduled start times.
 - Times of patients' scheduled arrivals on the day of surgery are chosen accordingly.
 - For surgeons with one case during the day, this principle also reduces the surgeon's waiting time.
 - For surgeons with more than one case during the day, this principle focuses on case sequencing.
 - Surgeons who consistently create delays are scheduled at the end of the day thereby minimizing patient waiting times.
5. Other priorities such as professional satisfaction, personal preferences, team building, and education

Adaptation of the Scenarios, Using Data Sent for the Staffing Analyses, Shown by Underlining

Illustrative scenario #1. At 10:35 AM, Dr. Bailey finished his first case of the day in OR 7. Dr. Stempler finished her second case of the day in OR 9. Only one housekeeper was available. The last case of the day in OR 7 was scheduled to end at 4:15 PM. The last case of the day in OR 9 was scheduled to finish at 5:30 PM. OR 7 was allocated from 7:15 AM to 3:00 PM. OR 9 was allocated from 7:15 AM to 7:00 PM. Safe cleaning of ORs is always the most important. Access will not be affected by the decision. Expected over-utilized OR time is 1.25 hr in OR 7 and 0.00 hr in OR 9. To maximize OR efficiency, the housekeeper assists in the cleaning of OR 7.

Illustrative scenario #2. A week from now, on next Friday, Dr. Shen has been allocated OR 18 for 8 hr. Also, Ophthalmology has been allocated one 8 hr OR. Ophthalmology has already scheduled 9 hr of cases into its OR. An ophthalmologist wants to schedule another 2 hr case. Dr. Shen has only booked one 2.5 hr case from 7:00 AM to 9:30 AM. The remaining ORs all have more than 5 hr of cases scheduled into them. What decision should be made? The surgeon from Ophthalmology with the new case can book the case, because all surgeons have access to OR time on whatever workday they choose. As Ophthalmology cases are routinely performed in OR 18, provided the surgeon is available at 10:00 AM, the OR time allocated to Dr. Shen should be released.