

Anesthesiologist Training for Decisions on Afternoons, Evenings, and Weekends

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Anesthesiologist Training for Decisions on Afternoons, Evenings, and Weekends



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Financial Disclosure

- Employment
 - I am employed by the University of Iowa, in part, to consult and analyze data for hospitals, anesthesia groups, and companies
 - Department of Anesthesia bills for my time
 - I receive no funds other than from the University of Iowa, including no travel reimbursement or honorarium
 - I own no healthcare stocks (other than indirectly through mutual funds)
 - I have tenure with no incentive program

Format of Training

- 45 minutes to complete the scenarios
 - If you have a question not precisely matching a scenario, write it down, and wait until the end
 - Scenario 7 depends on scenario 6, which depends on scenario 5, and so forth
 - Many questions will be covered toward the end
- Record each answer and score if right/wrong
 - Typical feedback is that topic is “obvious” – true?
 - 30 sec to read each scenario, when applicable
 - 45 sec to make a decision



Definitions of *Staffing*, *Staff Scheduling*, and *Staff Assignment*

- Staffing (months ahead)
 - Department of Anesthesiology plans 3 ORs in the main surgical suite for urgent cases between Monday 6 PM and Tuesday 7 AM
- Staff scheduling (weeks ahead)
 - Jill is scheduled Monday 8 AM to 6 PM
 - James is scheduled Monday starting at 6 PM
- Staff assignment (0-1 days ahead)
 - Alex is assigned to OR 3



Definition of *Tardiness*

- Three cases of same procedure are scheduled
- Expected OR times are 2 hr
- Expected turnover times are 30 min
- Scheduled start times: 8 AM, 10:30 AM, 1 PM
- First case entered the OR at 8:20 AM
- At 9 AM, expected *tardiness* of OR is 40 min
 - The 40 min = 20 min late + 20 min late
 - Two 20 min because there are two cases following the first case that started late



Definition of *Under-Utilized OR Time*

- Staffing is planned from 7:15 AM to 3:30 PM
- An OR's last case of the day ends at 1:30 PM
- There are 2 hours of under-utilized OR time
 - Under-utilized time is from 1:30 PM to 3:30 PM



Definition of *Over-Utilized OR Time*

- OR staffing is planned from 7 AM to 4 PM
- OR's last case of the day ends at 6 PM
- There are 2 hr of *over-utilized OR time*
 - Over-utilized OR time is from 4 PM to 6 PM



Precise Meaning of “Maximize OR Efficiency”

Inefficiency of use of OR time (\$) =
(Cost per hour of under-utilized OR time)
× (hours of under-utilized OR time)
+ (Cost per hour of over-utilized OR time)
× (hours of over-utilized OR time)

Strum DP et al. Anesthesiology 1999



Scenario 1 – Can Working Fast Increase OR Efficiency?

- OR nurses and nurse anesthetists are full-time, hourly employees
- Staffing is planned from 8 AM to 3:30 PM
- There is estimated to be 8.5 hr of cases
- Anesthesiologist gets every IV first stick, A lines and C lines first stick, and does a fiberoptic intubation in 8 minutes
- OR finishes at 3:30 PM, instead of 4:30 PM
- Has anesthesiologist increased OR efficiency?



Scenario 1 – Can Working Fast Increase OR Efficiency?

- OR nurses and nurse anesthetists are full-time, hourly employees
- On the day of surgery, the cost of an hour of under-utilized OR time is negligible relative to the cost of an hour of over-utilized OR time



Meaning of Maximizing OR Efficiency on Day of Surgery

Inefficiency of use of OR time (\$) \cong
~~(Cost per hour of under-utilized OR time)~~
× (hours of under-utilized OR time)
+ (Cost per hour of over-utilized OR time)
× (hours of over-utilized OR time)

Dexter F, Traub RD. Anesth Analg 2002

McIntosh C et al. Anesth Analg 2006



Meaning of Maximizing OR Efficiency on Day of Surgery

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(Cost per hour of over-utilized OR time)
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Meaning of Maximizing OR Efficiency on Day of Surgery

Inefficiency of use of OR time (\$) \cong

~~(Cost per hour of over-utilized OR time)~~

\times (hours of over-utilized OR time)

Constant



Meaning of Maximizing OR Efficiency on Day of Surgery

Inefficiency of use of OR time (\$) \cong

~~(Cost per hour of over-utilized OR time)~~

\times (hours of over-utilized OR time)

Constant

- Implication

- Maximize OR efficiency on the day of surgery by minimizing hours of over-utilized OR time



Meaning of Maximizing OR Efficiency on Day of Surgery

Inefficiency of use of OR time (\$) \cong

~~(Cost per hour of over-utilized OR time)~~

\times (hours of over-utilized OR time)

Constant

- Implication

- Maximize OR efficiency ***on the day of surgery*** by minimizing hours of over-utilized OR time



Scenario 1 – Can Working Fast Increase OR Efficiency?

- Scenario
 - Staffing is planned from 8 AM to 3:30 PM
 - Fast anesthesiologist finished cases in 7.5 hr instead of in the expected 8.5 hr
 - Finished at 3:30 PM instead of at 4:30 PM
 - Fast anesthesiologist increased OR efficiency by preventing 1 hr of over-utilized OR time



Scenario 1 – Can Working Fast Increase OR Efficiency?

- OR nurses, nurse anesthetists, and anesthesiologists are full-time employees
- Staffing is planned from **8 AM to ~~3:30~~ 6 PM**
- There is estimated to be 8.5 hr of cases
- Anesthesiologist gets every IV first stick, A lines and C lines first stick, and does a fiberoptic intubation in 8 minutes
- OR finishes at 3:30 PM, instead of 4:30 PM
- **Has anesthesiologist increased OR efficiency?**



Scenario 1 – Can Working Fast Increase OR Efficiency?

- Scenario

- Staffing is planned from 8 AM to ~~3:30~~ **6 PM**
- Fast anesthesiologist finished cases in 7.5 hr instead of in the expected 8.5 hr
- Fast anesthesiologist ~~increased~~ *did not increase* OR efficiency



Scenario 1 – Can Working Fast Increase OR Efficiency?

- Scenario

- Staffing is planned from 8 AM to ~~3:30~~ **6** PM
- Fast anesthesiologist finished cases in 7.5 hr instead of in the expected 8.5 hr
- Fast anesthesiologist ~~increased~~ *did not increase* OR efficiency

Good (rational) OR management operational decision-making is highly sensitive to the staffing for each OR, and requires knowing the staffing for each OR

Organizational Decision Making by Ordered Priorities

- Listed in order of priority
 1. Patient safety is preeminent
 2. Every surgeon has open access to OR time on *Any* future *Workday* for elective cases
 3. Maximize OR efficiency by minimizing hours of over-utilized OR time
 4. Reducing patient waiting by reducing expected tardiness for elective cases and waiting for non-elective cases
 5. Personal Satisfaction



Scenario 2 – Anesthesiologist Reduces Turnover Times

- Staffing is planned from 7:15 AM to 3:30 PM
- Anesthesiologist is assigned to supervise resident physicians in OR 3 and OR 4
- These ORs have just finished their first cases
- The second and last case of the day in OR 3 is expected to be finished at 2:30 PM
- The second and last case of the day in OR 4 is expected to be finished at 4:30 PM
- Which OR should anesthesiologist start next?



Scenario 2 – Anesthesiologist Reduces Turnover Times

- *Patient safety* is unaffected by decision
- Open *access* is unaffected by the decision
- *OR efficiency*
 - OR 3 expected 0 hr of over-utilized OR time
 - Finish 2:30 PM, but staffing to 3:30 PM
 - OR 4 expected 1 hr of over-utilized OR time
 - Finish 4:30 PM, but staffing to 3:30 PM
- If the patient for OR 4 is ready, the anesthesiologist should start OR 4 first



Scenario 2 – Anesthesiologist Reduces Turnover Times

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- These ORs have just finished their first cases
- The second and last case of the day in OR 3 is expected to be finished at 2:30 PM
- The second and last case of the day in OR 4 is expected to be finished at 4:30 PM
- Which OR should anesthesiologist start next?



Scenario 2 – Anesthesiologist Reduces Turnover Times

- *Patient safety* is unaffected by decision
- Open *access* is unaffected by decision
- *OR efficiency* is unaffected by decision
 - OR 1 expected 0 over-utilized hours
 - OR 2 expected ~~1~~ **0** over-utilized hours
- *Patient waiting* is unaffected by decision
 - Last case of the day in both ORs
- *Personal satisfaction* may be affected
 - Whatever anesthesiologist thinks best



Scenario 2 – Anesthesiologist Reduces Turnover Times

- Moral
 - To make good (rational) OR management operational decisions, you need to know the staffing planned for each OR



Scenario 3 – Decision Based on Patient Safety

- Staffing is planned from 7:15 AM to 3:30 PM
- At 12:15, one OR is finished its elective cases
- All other ORs expected to be busy until 5 PM
- Transplant surgeon called three hours ago for cadaveric kidney transplant
 - Surgeon's assessment is that the remaining safe cold ischemic time is 10 hr
- Vascular surgeon has a ruptured AAA
- How sequence the cases based on the ordered priorities?



Scenario 3 – Decision Based on Patient Safety

- *Patient safety* is affected by decision
 - Ruptured AAA is done first
- Surgeon knows date and time of occurrence of event that requires urgent surgery or equivalently when symptoms began
 - Other examples are fracture for hip or right lower quadrant pain for appendectomy
- Hours from randomized/observational studies

Dexter F et al. J Clin Monit Comput 1999

Charalambous CP et al. Injury 2005



Scenario 4 – Moving Cases

- Staffing is planned from 7:15 AM to 3:30 PM
- OR 1 finishes last case of the day at 1:30 PM
- OR 2 is running behind
 - Its last case, scheduled from 2 PM to 3:30 PM, will not start until 5 PM
 - Anesthesia and nursing team assigned to OR 1 can perform the case safely
 - Surgeon and patient are ready
- Move the last case in OR 2 into OR 1?



Scenario 4 – Moving Cases

- *Patient safety* is unaffected by the decision
- Open *access* is unaffected by the decision
- *OR efficiency* is affected by the decision
 - Case performed entirely in over-utilized OR time if case is not moved
 - Over-utilized OR time likely reduced by at least 1.5 hr if case is moved
 - Move the case from OR 2 to OR 1



Scenario 5 – Reducing Staffing for Satisfaction

- Planned staffing is 3 ORs from 6 PM to 7 AM for non-elective cases
- Two ORs expected to finish case at 12 MN
- At 9:30 PM, third OR is finishing its case
- Third OR covered by backup anesthesiologist (clinical next day) and junior resident
- Sole pending case can wait safely another 8 hr
- Should backup anesthesiologist stay for case?



Scenario 5 – Reducing Staffing for Satisfaction

- Over-utilized OR time
 - Expect 0 hr of over-utilized OR time regardless of when start next case
- Patient and surgeon waiting
 - Reduced by starting case promptly
 - Start the case now
- When and how should the satisfaction of the backup anesthesiologist be addressed?



Scenario 5 – Reducing Staffing for Satisfaction

- Personal satisfaction of the backup anesthesiologist is affected by anesthesia department's staff scheduling and assignment
 - Address such issues with Vice Chair of Clinical Affairs or equivalent at appropriate time
- Staffing (i.e., OR allocations) is calculated from expected workload months in advance
 - Nursing, Anesthesia, and Surgical departments can then plan their staff scheduling and assignments independently



Scenario 6 – When Cases Exceed Staffing

- Saturday and Sunday staffing is 3 ORs x 24 hr for non-elective cases
- Not once in years have 3 ORs run non-stop for 24 hr on either Saturday or Sunday
- What information would be obtained to open 4 ORs on a Saturday?
 - Base list on the ordered priorities



Scenario 6 – When Cases Exceed Staffing

- *Patient safety*
 - With three ORs, a case could not reliably start by when the surgeon says it needs to start
- Open *access* to OR time
 - No effect, since do all the cases
- *OR efficiency*
 - Never open 4th OR other than for safety reasons, because would first fully fill the 3 ORs, which has never happened



Scenario 7 – Change in Patient Condition

- Staffing is 3 ORs from 6 PM to 7 AM
 - Two ORs will not finish cases until after 11 PM
- At 5:45 PM, two other ORs just finished cases
- At 6:00 PM, transporter leaves to pickup patient to undergo repair of elbow fracture
 - Medical deadline is to start case within 24 hr
- At 6:05 PM, OR notified of patient with expanding pseudoaneurysm of femoral artery
- Start both cases, or wait on elbow fracture case?



Scenario 7 – Change in Patient Condition

- *Patient safety*
 - Start the pseudoaneurysm repair
 - Elbow fracture choice is unaffected by decision
- Open *access* to OR time unaffected by decision
 - Will do both cases
- *OR efficiency* is affected by decision
 - If do both cases right-away, elbow fracture case would be result in over-utilized OR time
 - Only start the pseudoaneurysm case



Scenario 7 – Change in Patient Condition

- Reevaluate decision whenever ...
 - New case is scheduled
 - OR times are updated
 - On-going or pending cases
 - Condition of patient waiting changes



Scenario 7 – Change in Patient Condition

- Staffing is 3 ORs from 6 PM to 7 AM
 - Two ORs will not finish cases until after 11 PM
- At 5:45 PM, two other ORs just finished cases
- At 6:00 PM, transporter leaves to pickup patient to undergo repair of elbow fracture
 - Medical deadline is to start case within 24 hr
- At 6:05 PM, OR notified of patient with expanding pseudoaneurysm of femoral artery
- At 6:10 PM, notify orthopedic resident of delay



Scenario 7 – Change in Patient Condition

- At 6:15 PM, pseudoaneurysm case starts
- At 6:15 PM, orthopedic attending updates medical deadline for case to start within 1 hr
 - Anesthesiologist's judgment is that explanation is inconsistent with evidence-based medical practice
- Start the case for elbow fracture too?
 - How and when address attending surgeon's basis for changing medical deadline?



Scenario 7 – Change in Patient Condition

- *Patient safety* is basis for decision
 - Start elbow fracture case promptly
 - OR team stays late as over-utilized OR time
- Next day, anesthesiologist reviews case with Department of Anesthesia's Vice Chair of Clinical Affairs (or equivalent person)
 - Basis for complaint is that decision was not made based on institution's ordered priorities



- Comprehensive bibliography of peer reviewed articles in OR management
 - Dexter F, Epstein RD, Traub RD, Xiao Y. Making management decisions on the day of surgery based on operating room efficiency and patient waiting times. *Anesthesiology* 2004;101:1444-53
 - Dexter F, Willemsen-Dunlap A, Lee JD. OR managerial decision-making on the day of surgery with and without computer recommendations and status displays. *Anesth Analg* 2007;105:419-29
 - Dexter F, Lee JD, Dow AJ, Lubarsky DA. A psychological basis for anesthesiologists' OR managerial decision-making on the day of surgery. *Anesth Analg* 2007;105:430-4

- Example reports with calculations
- Lectures on drug and supply costs, PACU staffing, OR allocation and staffing, turnover times, anesthesia staffing, financial analysis, comparing surgical services among hospitals, and strategic decision making

