

The South African procedural times glossary

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The South African perioperative field has lagged behind other countries in developing a glossary of terms that can be used to compare individual operating rooms (ORs) within the same hospital, perioperative services across different systems, and larger elements of the country's health service. In 1998, the Association of Anesthesia Clinical Directors (AACD) in the United States of America (USA) established the procedural times glossary (PTG). We have developed an adaptation of the AACD's PTG with familiar South African terminology which will allow for better comparison between South African operating rooms as well as more informed comparison with the international literature. This first iteration is intended to start the conversation about procedural times and indices, and initiate a process aimed at refining these terms as further versions are required and developed.

Keywords: operating theatre management, operating theatre, operating theatre efficiency, metrics

Introduction

In South Africa, surgical and procedural services are provided by the parallel state and private healthcare systems. Challenges faced in the perioperative environment may differ greatly between these two systems, and even within each system. However, many of the obstacles are shared including suboptimal operating room utilisation, long turnaround times, maintenance of clinical quality and staffing challenges. The escalating complexity and cost of modern healthcare is increasing the financial pressure on funding mechanisms, both in the state and the private systems. It is also dictated that surgical services are provided in a safe, efficient and cost-effective manner. The ability to compare and contrast these systems requires metrics and benchmarks.

There are very few South African operating room (OR) performance comparisons available in literature. For example, no standard definition exists that reliably describes the beginning of the surgical procedure. The various interpretations include when the patient enters the operating suite, or the operating room; when anaesthesia commences; or when the surgeon makes their first incision. Similar ambiguity exists for all other procedural times, including the end time of a procedure. The unclear use of metrics and commonly defined targets can make the interpretation of any study originating in South Africa difficult to compare with international counterparts.¹

This lack of a South African set of common nomenclature and definitions of procedural times presents numerous challenges. The inefficient use of ORs and the escalating cost of healthcare in South Africa has necessitated the creation of a standard set of perioperative time markers, allowing for benchmarking, comparison and research. Perioperative healthcare providers

and managers urgently require a nationally agreed upon glossary of terminology describing OR performance metrics. This glossary should contain professional terms (and language) that are already familiar to South African healthcare professionals, while remaining aligned with international definitions.

Defining operating theatre and procedural times

The Association of Anesthesia Clinical Directors (AACD) in the United States of America (USA) was founded in October 1988 to provide a forum for anaesthesiologists whose primary responsibilities included OR management. The AACD united as an organisation to establish a standardised set of terms to describe, measure and assess the performance of OR and procedural (PR) areas. The AACD developed *A glossary of times used for scheduling and monitoring of diagnostic and therapeutic procedures*, commonly referred to as the procedural times glossary (PTG), which was originally published for use in 1998 and revised in 2018.²⁻⁵ The PTG defines a comprehensive array of OR times and metrics – enabling benchmarking within (and between) healthcare facilities and facilitating quality improvement initiatives and research.

With permission from the AACD, Healthcare Improvement Team South Africa (HITSa), a special interest group of the South African Society of Anaesthesiologists (SASA), has adapted this glossary for the perioperative services across South Africa. The primary aim was to remain as close to the original definitions as possible, to allow for national and international comparisons, as well as collaborative development of this glossary. Changes are predominantly to the language used, incorporating South African terms and phrases, but matched to the elements from the AACD's work. Since 1998, a myriad of research has established not only the applicability of the PTG, but also reaffirmed the

comprehensive nature of the glossary.^{6,7} Given the longevity of the PTG and its similarity to the South African glossary, we propose that the PTG serve as a roadmap to benchmark and compare OR performance in South Africa.

The procedural times glossary

The PTG metrics can be divided into the following four categories:

1. Procedural times
2. Procedural and scheduling definitions and time periods
3. Utilisation and efficiency indices
4. Patient categories

Procedural times (PT) are the time markers for events that occur in the perioperative process, from the time the patient is physically present in the facility to discharge from the postoperative recovery area. Once these basic data entries (or time stamps as used by the AACD) are recorded and analysed, theatre users and managers can understand the flow of patients through the perioperative environment.

Procedural and scheduling definitions and time periods (PSDTP) use data from PTs and provide a higher level of analysis. These values provide an interpretation of the PTs and serve as benchmarks both within the facility and against external standards.

Utilisation and efficiency indices (UEI) have numerous functions. These may help identify processes for improvement, such as delays due to patient issues. These may also help theatre managers determine operating theatre utilisation as an institution, by individual ORs, or by individual surgical services. These UEIs should help OR managers make informed tactical decisions for block allocations (i.e. which surgical services may need more time) and OR staffing patterns.

Patient categories (PC) provide broad categories tracking operational workflows for patients in the perioperative environment, irrespective of where the procedures are performed. For example, in-hospital (IH) patients may have their surgery in a day surgery unit, while outpatients (OP) may have their surgery in the main operating room. These demographic data may uncover inefficiencies that exist beyond the purview of the perioperative services (i.e. OP requiring IP stays).

The metrics are described in more detail in Table 1.

Importantly, capturing the PT data points (or time stamps) can be used to calculate the times between each data point, and these durations represent the basis of OR management. For many organisations, tracking every possible time stamp is labour intensive and may prove unnecessary. In the USA, the most commonly reported PTs are: patient in-room, anaesthesia start, anaesthesia induction, procedure/surgery start time, procedure/surgery finish time, and patient out-of-room. Using these key metrics and time periods, OR managers can assess flow through the entire perioperative period, from arrival in hospital until discharge from the recovery unit or post-anaesthesia care unit. Furthermore, these measures allow for analysis of where

key delays are occurring and can facilitate discussions about improving efficiency.

As the key financial driver for many healthcare systems, every perioperative service member (e.g. nurse, surgeon, technician or anaesthesia provider) should recognise that these metrics are meant to be unbiased, reflecting all the marginal gains possible when patient safety is balanced against operational efficiency. The presentation of OR management data should aim to make all OR users custodians of OR time. Frequent communication between OR managers and the surgical disciplines using the perioperative area should be encouraged. Disciplines that cannot use their allocated OR time should inform OR management timeously, so that this resource can be offered to other disciplines, who may have long waiting lists. It is thus the responsibility of all OR users to ensure that OR time is used optimally.

While the PTG bases operational metrics on minutes and hours, there are direct financial implications in rands and cents. The operating suite has frequently been compared to a commercial aeroplane⁸ and an OR is similar to a seat on an airplane in many respects. In the airline industry, every seat left empty once a plane takes off represents lost revenue that cannot be recovered.

Certain aspects of perioperative care make OR services ideal for the application of yield management techniques.⁹ First, a perioperative system operates with a fixed capacity. Second, demand is clearly segmented into identified partitions and the product is usually sold in advance (block allocations are assigned to specific surgical services). Third, OR capacity is perishable "inventory" (i.e. unused time cannot be stored for later use). Fourth, the costs of marginal production are low, but the costs of expanding capacity are high. Building more ORs is an expensive, strategic decision. Most airline companies require that most seats are filled on all flights before the purchase of a new plane is considered. By contrast, the nursing and anaesthesia staffing patterns can be adjusted either on the day before or the day of surgery to expand capacity. These variable costs depend on the staffing patterns and block allocations. OR and hospital managers can schedule operating lists into time periods where the allocation of staff and resources are cheaper – ensuring that sufficient staff are available and decreasing the reliance on locum or agency staff. These cost savings may be significant and allow for the creation of additional OR time (e.g. opening extra ORs, additional lists, etc.).

Productivity encourages maximal output with little regard for the inputs, while efficiency is a balance of the outputs and inputs – aiming to use the minimum number of inputs for the ideal output. OR managers should appreciate that there is a tension between efficiency and productivity. For example, when considering the gaps in OR utilisation, it is important to appreciate that ORs can only be used optimally if sufficient time is allowed for the cleaning and preparation of the OR between cases. ORs that are not adequately prepared may have longer delays during cases as surgeons wait for equipment, instruments and/or consumables. Additionally, ORs that have not been cleaned properly may contribute to a higher incidence of postoperative infections and poorer patient outcomes.

Conclusion

This first South African adaptation of the AACD's PTG (i.e. SAPTG) is intended to create a national set of definitions for the perioperative period governing procedural definitions, times, periods and indices. The first version of the SAPTG is intended to provide a comprehensive list of OR data that may assist OR users,

OR managers and hospital managers in improving perioperative efficiency (and not just productivity). Input from all users (in all sectors) will be encouraged to allow the document to remain relevant and useful, with future updates and revisions expected. Future studies and operational improvement efforts should continue to test the validity of the SAPTG while advancing the management acumen of OR managers in South Africa.

Table I: South African procedural times glossary (SAPTG)

| Glossary Item | Abbreviation | Definition | Description |
|-------------------------|--------------|-------------------------------------|---|
| PROCEDURAL TIMES | | | |
| 1.1 | PIF | Patient in facility | Time patient arrives at the healthcare facility. |
| 1.2 | PRT | Patient ready for transport | Time when all preparations required for theatre, before transport (e.g. consent, radiology, labs, etc.) have been completed. |
| 1.3 | PSF | Patient sent for | Time when the porter is notified to deliver the patient to the OR-PR. |
| 1.4 | PA | Patient available | Time the patient arrives in the OR-PR pre-procedure area. |
| 1.5 | RSS | Room setup start | Time when the personnel begin setting up the OR-PR supplies and equipment for the next case. |
| 1.6 | AS | Anaesthesia start | Time when any member (nurse/student/physician) of the anaesthesia team begins preparing the patient for anaesthesia (e.g. applying monitors, positioning for anaesthesia, etc.). |
| 1.7 | RR | Room ready | Time when the OR-PR is cleaned and supplies and equipment for the next case are present. |
| 1.8 | PIR | Patient in room | Time when the patient enters the OR-PR (also known as "wheels in" or start time). |
| 1.9 | AFA | Anaesthesiologist first available | Time of arrival in the OR-PR of the first anaesthetist qualified to induce anaesthesia. This need not be a specialist anaesthesiologist, but a physician anaesthesia provider capable of providing anaesthesia unsupervised. |
| 1.10 | PPFA | Procedure physician first available | Time of arrival in the OR-PR of the first physician or surgeon qualified to position and prepare the patient. |
| 1.11 | ARI | Anaesthetist of record in | Time of arrival in OR-PR of the most senior anaesthesia provider, who will take ultimate responsibility for the case (person who will be recorded in the theatre register as the primary anaesthetist for the case). In the case of a single anaesthesia provider it will be the same time as 1.9 AFA. |
| 1.12 | AI | Anaesthesia induction | Time when the anaesthetist begins the administration of agents intended to provide the level of anaesthesia required for the scheduled procedure. |
| 1.13 | AR | Anaesthesia ready | Time when the patient has achieved a sufficient level of anaesthesia to begin surgical preparation and the remaining anaesthesia chores do not prevent positioning and preparation of the patient. |
| 1.14 | PS | Position-preparation start | Time at which the nursing or surgical team begins positioning and preparing the patient for the procedure (also known as "surgical preparation time"). |
| 1.15 | PC | Preparation completed | Time at which preparing and draping have been completed and the patient is ready for the procedure to start. |
| 1.16 | PPRI | Procedure physician of record in | Time of arrival in the OR-PR of the physician or surgeon of record (senior/primary surgeon; person who will be recorded in the theatre register as the primary physician or surgeon for the case) – may be the same as 1.10 PPFA. |
| 1.17 | PST | Procedure-surgery start time | Time when the procedure begins (incision for surgical procedure/insertion of scope/start of examination under anaesthesia/x-ray for radiological procedure, etc.) (also known as "start of surgery time"). |
| 1.18 | PCB | Procedure-surgery conclusion begun | Time when the diagnostic or therapeutic interventions are completed and attempts are made by the physician/surgeon to end any noxious stimuli (beginning of wound closure/removal of scope, etc.). |
| 1.19 | PPRO | Procedure physician of record out | Time when the physician or surgeon of record (primary/senior physician or surgeon) leaves the OR-PR, if more than one surgeon performed the procedure. For clarity, the PF time (1.20.1 Procedure-surgery finish) is the time used for when the surgical procedure is completed. |
| 1.20 1.20.1 | PF | Procedure-surgery finish | Time when all instrument and swab counts are completed and verified as correct; all postoperative radiological OR-PR studies are completed; all dressings and drains are secured and the physician/surgeon has completed all procedure-related activities on the patient (also known as "end of surgery time"). |

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| 1.20.2 | ACT | Anaesthesia completion time | Time when the anaesthetist disconnects the patient from monitoring and prepares to transfer the patient to recovery/PACU, etc. (transfers the patient to their transfer bed). |
| 1.21 | POR | Patient out of room | Time when the patient leaves OR-PR. |
| 1.22 | RCS | Room clean-up start | Time when cleaning team begins clean-up of OR-PR. |
| 1.23 | APACU | Arrival in Recovery/PACU/HCU/ICU | Time patient arrives in recovery/PACU/HCU/ICU |
| 1.24 | AF | Anaesthesia finish | Time when the anaesthetist hands the patient over to be cared for by another clinical team, such that the patient no longer falls under the direct care of the anaesthesia team. This could therefore be a nurse-led team in a recovery unit, or mixed physician/nurse teams in PACU, HCU or ICU, whatever level of staffing is appropriate for that site. |
| 1.25 | RCF | Room clean-up finish | Time OR-PR is clean and ready for setup of supplies and equipment for the next case. |
| 1.26 | RDPACU | Ready for discharge from recovery/PACU | Time patient is assessed to be ready for discharge from the recovery/PACU. |
| 1.27 | DPACU | Discharge from recovery/PACU | Time patient is transported out of recovery/PACU. |
| 1.28 | | | |
| 1.28.1 | ASDSR | Arrival in SDSR unit | Time patient arrives in SDSR unit or day surgery ward. |
| 1.28.2 | AW | Arrival in ward | Time patient arrives in ward. |
| 1.29 | RSDSDST | Ready for discharge from SDSR unit | Time patient is assessed as ready for discharge from SDSR unit, or day surgery ward, to home or other facility. |
| 1.30 | DSDSR | Discharge from SDSR unit | Time patient leaves SDSR unit, or day surgery ward (to home or other facility). |

PROCEDURAL AND SCHEDULING DEFINITIONS AND TIME PERIODS

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| 2.1 | APT | Anaesthesia preparation time | Time from anaesthesia start to anaesthesia ready. |
| 2.2 | ACL | Average case length | Total hours divided by total number of cases performed within those hours. |
| 2.3 | BT | Block time | Hours of OR-PR time reserved for a given service/surgeon/physician within defined cut-off period (e.g. 72 hours prior to day of surgery). This is time into which only the given service may be scheduled. (Also known as available or allocated time.) |
| 2.4 | CT | Case time | Time from room setup start to room clean-up finish. |
| 2.5 | ESH | Early start hours | Hours of case time performed prior to the normal day's start time when it is not expected that the patient out of room time will be before the normal start time for that day. |
| 2.6 | EWHH | Evening-weekend-holiday hours | Hours of case time performed outside of resource hours. (Also known as afterhours.) |
| 2.7 | IBH | In own block hours | Hours of case time performed during a service's own block time. (For a case to be counted as IBH it must begin during that given service's block time.) |
| 2.8 | OT | Open time | Hours of OR-PR time not reserved for any particular service, into which any service/surgeon/physician may schedule according to the rules of the establishment. (Also known as discretionary time.) |
| 2.9 | OBH | Outside own block hours | Hours of case time performed during resource hours, but outside of the service's block time (i.e. utilised open time or another service's allocated theatre time). |
| 2.10 | OVRH | Overrun hours | Hours of case time completed after the scheduled closure time of the OR-PR (i.e. after the end of that day's resource hours). |
| 2.11 | RT | Release time | Hours of the OR-PR time that are released from a service's block time and converted to open time. Typically done when a service anticipated that it will be unable to use the block time because of meetings or vacation. |
| 2.12 | RH | Resource hours | Total number of hours scheduled to be available for performance of procedures (i.e. the sum of all available block time and open time). Typically provided on a weekly basis, but may be analysed daily, weekly, monthly or yearly as required. |
| 2.13 | RCT | Room clean-up time | Time from patient out of room, to room clean-up finish. |
| 2.14 | RC | Room close | Time at which the OR-PR should be empty and the assigned personnel free to be discharged. |
| 2.15 | RO | Room open | Time when appropriate staff are scheduled to be present and are expected to have the OR-PR available for patient occupancy. |

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| 2.16 | RST | Room setup time | Time from room setup start to room ready. |
| 2.17 | | Service | A group of physicians or surgeons together perform a circumscribed set of operative or diagnostic procedures (e.g. general surgery or interventional radiology). Generally, any member of a service may schedule into that service's block time. Similarly, OR-PR time used by a given physician or surgeon is credited to his/her service's total hours. |
| 2.18 | SPT | Surgical preparation time | Time from position-preparation start to procedure-surgery start time. |
| 2.19 | ST | Start time | Patient in room time. (Time when the patient enters the OR-PR.) |
| 2.20 | TC | Total cases | Cumulative total of all cases done in a given time period; may be subdivided by service/physician/surgeon. |
| 2.21 | TH | Total hours | Sum of all case time times for a given period of time. TH = IBH + OBH + EWHH; may be subdivided by service/physician/surgeon. |
| 2.22 | TOT | Turnover time | Time from prior patient out of room to succeeding patient in room time for sequentially scheduled cases. |

UTILISATION AND EFFICIENCY INDICES

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| 3.1 | ASU | Adjusted percent service utilisation | $(IBH+OBH) \times 100 / BT$ This measures the percentage of time a service utilises their block time during resource hours. This is an adjusted index, compared with raw utilisation, as it gives a service "credit" for the time necessary to setup and clean-up a room, during which time a patient cannot be in the room. It may exceed 100% as it includes cases performed during resource hours that are outside own block hours. |
| 3.2 | AURH | Adjusted percent utilised resource hours | $(TH-EWHH) \times 100 / RH$ This calculation provides the percentage of time that the OR-PRs are being prepared for a patient, occupied by a patient, or being cleaned after taking care of a patient during resource hours. It is adjusted, compared to raw utilisation, as it includes the time necessary to setup and clean-up a room, during which time a patient cannot be in the room. |
| 3.3 | | Delays | Delays may be due to the following: |
| 3.3.1 | | Patient issues | Funder problems; Patient arrived late; Patient not nil by mouth; Abnormal lab results, surgical issues, complications arose. |
| 3.3.2 | | System issues | Results unavailable; Blood unavailable; Patient not ready in the ward, transport delay, elevator delay; Previous case ran late; Cases bumped for emergency case; Equipment unavailable, or malfunction; X-rays not available, radiologist not available; Delay in receiving ward bed; Insufficient post procedure care beds; ICU delay; Factors occurring independently of theatre management (staff shortages, civil unrest, catastrophic events, etc.). |
| 3.3.3 | | Practitioner issues | Further workup required; No consent; Physician/surgeon arrived late, not available; Anaesthetist arrived late, not available; Inaccurate list planning; Prolonged setup. |
| 3.4 | | Early start | When patient in room, actual, is prior to patient in room, scheduled. |
| 3.4.1 | | With overlap | When a case starts early but prior to the room clean-up finished, actual, of the case originally scheduled to precede it (this occurs when either the preceding or following case is moved to a different OR-PR than originally scheduled or the case commences in another area, e.g. induction room/procedure room). |
| 3.4.2 | | Without overlap | When a case starts early but after room clean-up finished, actual, of the case originally scheduled to precede it (this may occur because there is no preceding case or the preceding case finishes earlier than scheduled). |
| 3.5 | | Late start | When patient in room, actual, is after patient in room, scheduled. |
| 3.5.1 | | With no interference | When room clean-up finished, actual, of the preceding case occurs before the room setup, scheduled, of the following case (i.e. the OR-PR is available prior to or at the time that preparation for the next case is supposed to begin). |
| 3.5.2 | | With interference | When room clean-up finished, actual, of the preceding case occurs after the room setup, scheduled, of the following case (i.e. the OR-PR is not available at the time that preparation for the next case is supposed to begin either because it is still occupied or clean-up has not occurred). |
| 3.6 | | Overrun | When room clean-up finished, actual, for the last scheduled case of the day is later than room close. This may be caused by a late start, a case time, actual, greater than case time, scheduled, or a combination of these. |
| 3.7 | PI | Productivity index | Percent of time per hour that a patient is in the OR-PR during the prime shift time (e.g. the first 8 hrs). |

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| 3.8 | RU | Raw utilisation | For the system as a whole, this is the percent of time that patients are in the room during resources hours (see AURH). For an individual service, this is the percent of the block time during which the service has a patient in the OR-PR (see ASU). |
| 3.9 | | Room gap | Time OR-PRs are vacant during resource hours. |
| 3.9.1 | LSG | Empty room gap (or late start) | Planned: when patient in room, scheduled, is later than room open. Unplanned: when patient in room, actual, is later than room open. |
| 3.9.2 | BCG | Between case gap | Planned: when patient in room, scheduled, is later than the room clean-up finished, scheduled, of the preceding case. Unplanned: when patient in room, actual, is later than the room clean-up finished, actual, of the preceding case. |
| 3.9.3 | ESG | End of schedule gap | Planned: when room clean-up finished, scheduled, occurs before room close. Unplanned: when room clean-up finished, actual, occurs before room close. |
| 3.9.4 | TGH | Total gap hours | TGH = LSG + BCG + ESG |

PATIENT CATEGORIES

| | | | |
|-----|-----|--------------------|---|
| 4.1 | IH | In hospital | Patient admitted to and residing in the hospital prior to the scheduled surgery/procedure. |
| 4.2 | OP | Outpatient | Patient coming in on the day of surgery/procedure and is expected to return home following the procedure. |
| 4.3 | SDA | Same-day admit | Patient coming in on the day of surgery/procedure and will be admitted to the hospital following the procedure. |
| 4.4 | ONR | Overnight recovery | Patient coming in on day of surgery/procedure but requires overnight recovery prior to returning home. These patients are never admitted to the hospital as inpatients but may remain in the recovery facility for 12–24 hours after the surgery/procedure. |

OR-PR – operating room-procedure room; PACU – post anaesthesia care unit; HCU – high care unit; ICU – intensive care unit; SDR – same-day surgery recovery; TH – total hours; IBH – in own block hours; OBH – outside own block hours; EWHH – evening-weekend-holiday hours; BT – block time; RH – resource hours; TGH – total gap hours; LSG – empty room gap (or late start); BCG – between case gap; ESG – end of schedule gap

Conflict of interest

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