ORIOLE

Operating Room Intelligence

on-line environment

Calculations Manual

Redwing Business Intelligence Ltd

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Summary

Establishing solid metrics to build good Key Performance Indicator is not easy, nor is *understanding* exactly how the captured data points are aggregated into KPIs.

This section of the documentation defines exactly what is captured, and what is not. It will also explain the ramifications of not capturing certain data items, and the impact of that non-capture on delivery of actionable information. It will include how just how the data that is present is built up into complex aggregations, and will show how those complex aggregations are used in presentation of Key Theatre Performance Indicators.

Note that all calculations and KPIs should be fully consistent with the Audit Commission's Acute Hospital Portfolio Review of 2003.

Session Type Breakdown

The following graphic shows how sessions are broken down into four categories. The numbers are sample data which will be used in the example calculations.
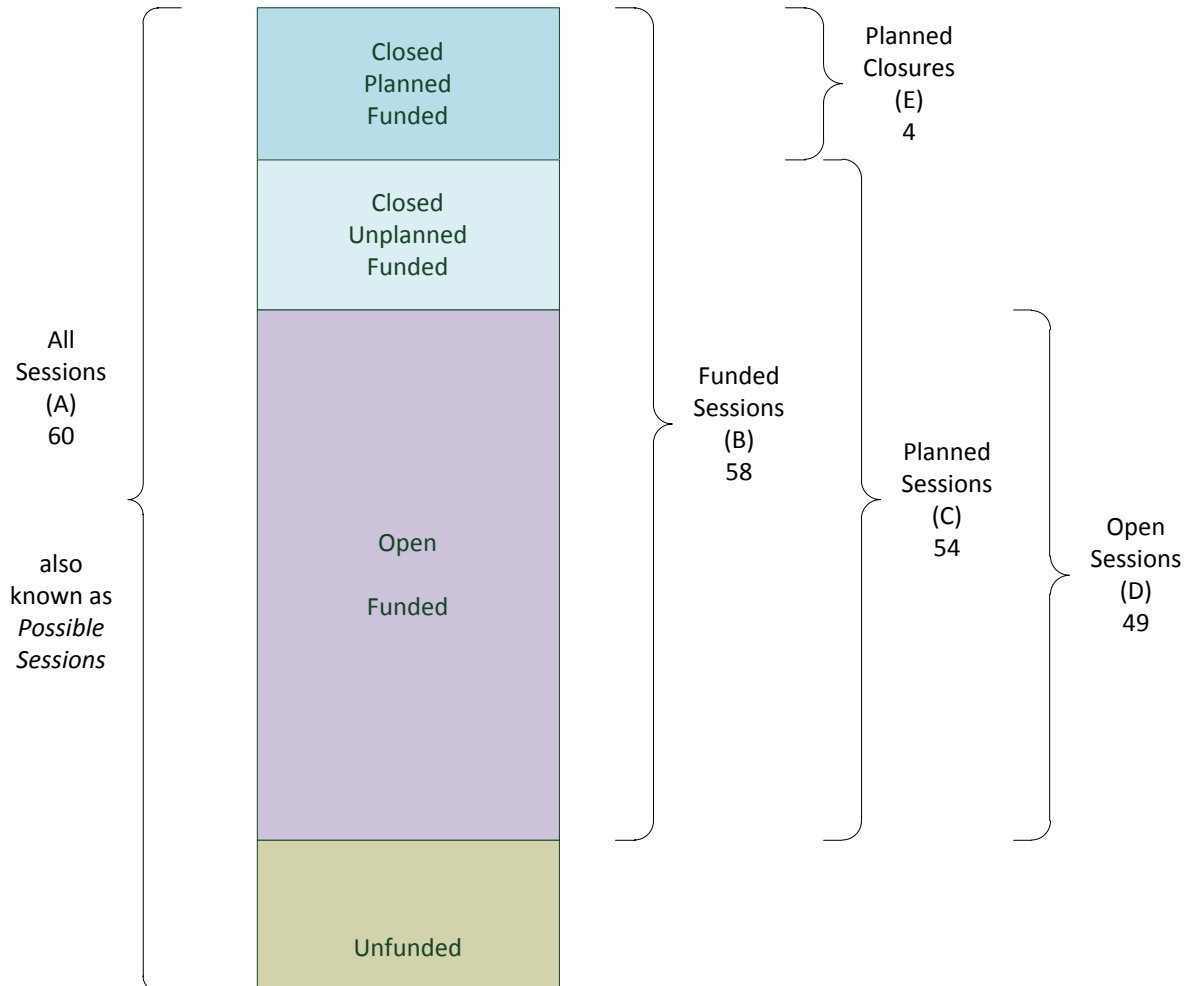
In our sample, we have 2 sessions a day (an all-day session counts as 2 sessions for our purposes), 5 days a week, and 6 theatres. This makes All Sessions = 60.

There are two unfunded sessions, making the number of Funded Sessions = 58.

At session planning time, it was decided that 4 of those sessions would be closed (a variety of reasons can be recorded for closure, but that does not concern us here). Thus Planned Closures = 4 and Planned Sessions where theatre lists will be generated, and real patients scheduled for procedures = 54.
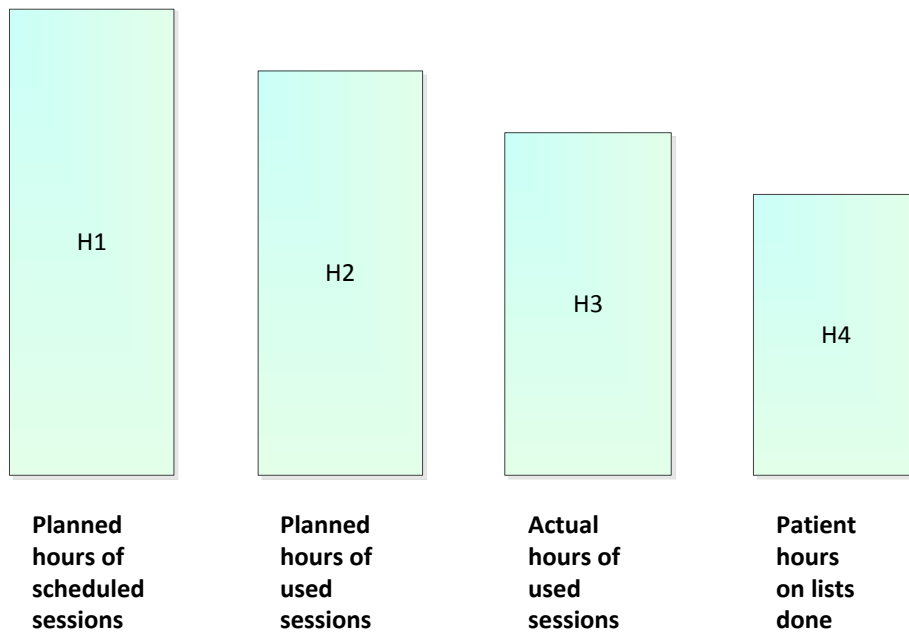
Finally, there will be some Unplanned Closures (for lack of beds, say) and this will reduce the number of sessions where surgery is actually performed to Open Sessions = 49. In our example, there are 5 Closed Unplanned Funded sessions.

Further data requirements

This foregoing provides *part* of what is required to calculate and generate Key Performance Indicators.

The following graphic is from the Audit Commission report:

Chart showing key data needed to monitor utilisation

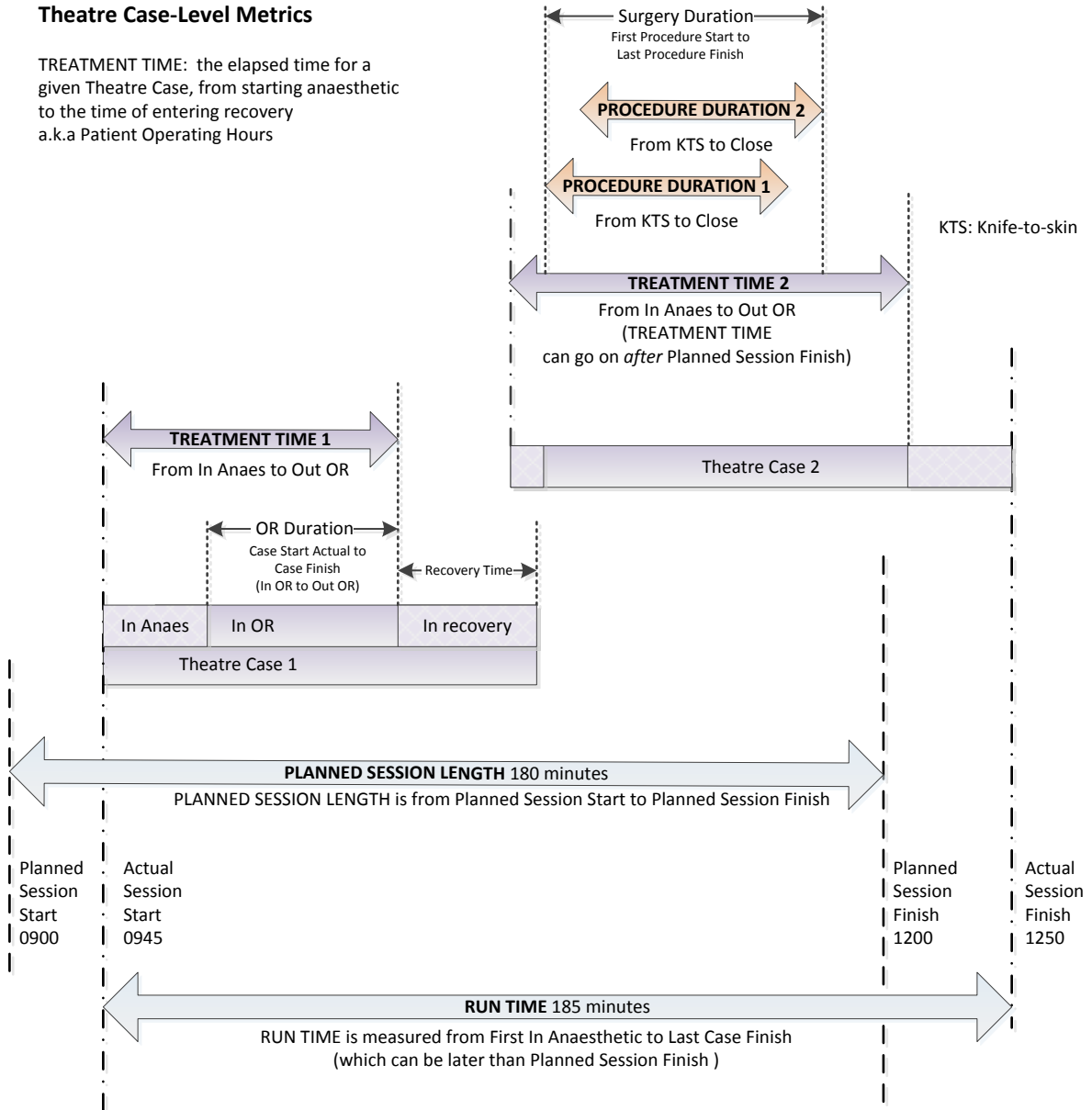| **Planned hours of scheduled sessions** | **Planned hours of used sessions** | **Actual hours of used sessions** | **Patient hours on lists done** |

The session type breakdown gave us H1 and H2.

We require more.

The following graphic shows how and where H3 and H4 are generated.

Theatre Case-Level Metrics

TREATMENT TIME: the elapsed time for a given Theatre Case, from starting anaesthetic to the time of entering recovery
a.k.a Patient Operating Hours

Surgery Duration
First Procedure Start to Last Procedure Finish

PROCEDURE DURATION 2
From KTS to Close

PROCEDURE DURATION 1
From KTS to Close

KTS: Knife-to-skin

TREATMENT TIME 2
From In Anaes to Out OR
(TREATMENT TIME can go on *after* Planned Session Finish)

Theatre Case 2

TREATMENT TIME 1
From In Anaes to Out OR

OR Duration
Case Start Actual to Case Finish
(In OR to Out OR)

Recovery Time

In Anaes	In OR	In recovery

Theatre Case 1

PLANNED SESSION LENGTH 180 minutes
PLANNED SESSION LENGTH is from Planned Session Start to Planned Session Finish

Planned Session Start 0900	Actual Session Start 0945	Planned Session Finish 1200	Actual Session Finish 1250

RUN TIME 185 minutes
RUN TIME is measured from First In Anaesthetic to Last Case Finish
(which can be later than Planned Session Finish)

Session-Level Metrics

PLANNED SESSION LENGTH: Planned Session Length for a funded session, whether open or closed (planned or unplanned)
a.k.a. H1 Planned hours of scheduled sessions

OPEN SESSION LENGTH: Planned Session Length for a funded *and open* (i.e. used) session
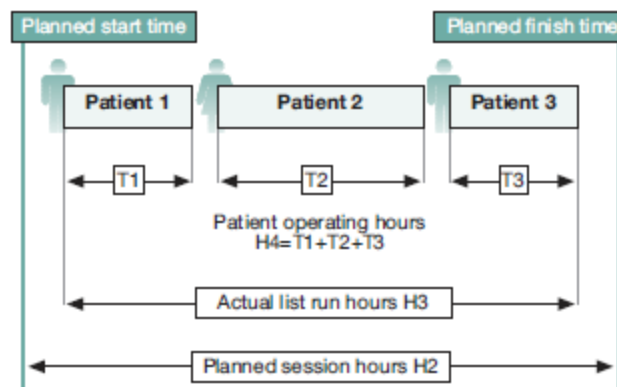a.k.a. H2 Planned hours of used sessions

RUN TIME: Actual run time of lists from start of first Theatre Case to exit OR of last Theatre Case in session
a.k.a. H3 Actual hours of used sessions

TREATMENT TIME: Sum of all TREATMENT TIMES for each Theatre Case in the session
a.k.a. H4 Patient hours on lists done.   a.k.a. Session Treatment Duration

Theatre Utilisation KPIs

KPI			Target	Example		
#2 RUN RATE (H3/H2 ratio) (>100 means overrun)	RUN TIME —————— OPEN SESSION LENGTH		89%+	185 — 180	=	103%
#3 OPERATING RATE (H4/H3 ratio)	TREATMENT TIME ———————— RUN TIME		92%+	150 — 185	=	81%
#4 UTILISATION RATE (H4/H1 ratio)	TREATMENT TIME ———————— PLANNED SESSION LENGTH		73%+	150 — 180	=	83%

This is how KPIs #1 - #4 are described in the Audit Commission report:

Indicator	Calculation (see chart)	What it represents
Planned hours of sessions used, as a percentage of planned hours of planned sessions	100 H2 / H1	Difference between 100 and the indicator represents hours lost because of cancelled sessions
Actual run time of lists as a percentage of their session planned hours	100 H3 / H2	Difference between 100 and the indicator represents hours lost because of list underruns. An indicator greater than 100 shows list overruns
Patient operation hours as a percentage of anaesthetic and surgical hours	100 H4 / H3	Difference between 100 and the indicator represents hours lost because of gaps between patients on a list
End utilisation of the original planned hours	100 H4 / H1	The proportion of the original planned hours that was used for operating

The first indicator (the H2/H1 ratio) forms part of a later set of KPIs around closed sessions.

Theatre Usage KPIs

The examples are based on simple counts; in practice, they would be the total number of minutes.

KPI		Target	Example
#1 PLANNED USAGE RATE (a.k.a. Planned Availability)	Planned Sessions ———————— Funded Sessions	90%	$\dfrac{54}{58}$ = 93%
Actual Usage Rate (Inverse of Unplanned Closure Rate, and hence not necessary)	Open Sessions ———————— Planned Sessions		$\dfrac{49}{54}$ = 91%

Theatre Usage KPIs
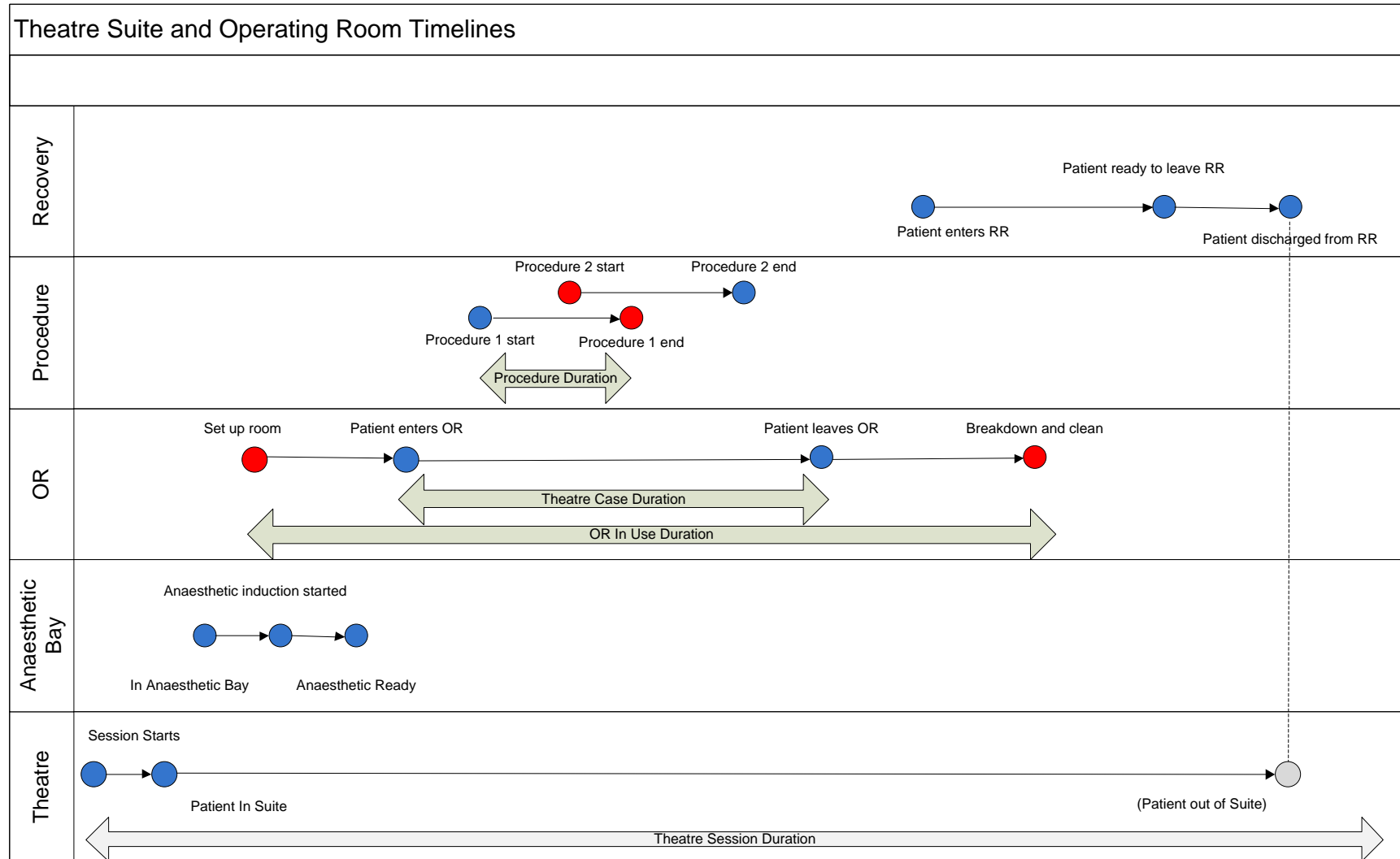
Theatre Closure KPIs

Note that the do not have KPI numbers, nor do they have target percentages; they are not directly referenced in the Audit Commission report. A suggested goal is provided.

Closure Rates				
Overall Closure Rate	$\dfrac{B-D}{D}=$	$\dfrac{\text{Funded - Open}}{\text{Funded Sessions}}$	10%	$\dfrac{58-49}{58}=16\%$
Planned Closure Rate	$\dfrac{E}{B}=$	$\dfrac{\text{Planned Closures}}{\text{Funded Sessions}}$	6%	$\dfrac{4}{58}=7\%$
Unplanned Closure Rate	$\dfrac{C-D}{C}=$	$\dfrac{\text{Planned Sessions - Open}}{\text{Planned Sessions}}$	4%	$\dfrac{54-49}{54}=9\%$

Sample Scorecard:

	Value	Goal and Status		Trend
Operating Rate	0.97	0.87	0.10	⬆
Run Rate	0.85	0.92	-0.07	⬆
Utilisation Rate	0.72	0.73	-0.01	⬆

Operating Room Timelines and Data Capture points (red = not captured)

Theatre Suite and Operating Room Timelines

Recovery

Patient ready to leave RR

Patient enters RR

Patient discharged from RR

Procedure

Procedure 2 start

Procedure 2 end

Procedure 1 start

Procedure 1 end

Procedure Duration

OR

Set up room

Patient enters OR

Patient leaves OR

Breakdown and clean

Theatre Case Duration

OR In Use Duration

Anaesthetic Bay

Anaesthetic induction started

In Anaesthetic Bay

Anaesthetic Ready

Theatre

Session Starts

Patient In Suite

(Patient out of Suite)

Theatre Session Duration

Session Calculations

Run Time	Run Time is measured from First In Anaesthetic to Last Case Finish (but no later than Planned Session Finish) **REMOVE?**	DATEDIFF(mi,Session_First_Case_In_Anaesthetic, case when Session_Finish_Time < Session_Last_Case_Finish then Session_Finish_Time else Session_Last_Case_Finish end)
Session Length	From Session actual start, to finish	DATEDIFF(mi, Session_Start_Time, Session_Finish_Time)
Late Start Flag (used for counting)	Set to 1 (True) if session start time < (first case in anaesthetic + 5 minutes), otherwise set to zero (false)	case when (DATEDIFF(mi,Session_Start_Time, Session_First_Case_In_Anaesthetic)-5)>0 then 1 else 0 end
Late Start Mins	From Session Start to First Case in Anaesthetic with no slack or freeway; zero if Late Start Flag is zero	case when (DATEDIFF(mi,Session_Start_Time, Session_First_Case_In_Anaesthetic)-5)>0 then DATEDIFF(mi,Session_Start_Time, Session_First_Case_In_Anaesthetic) else 0 end
Late Finish Flag (used for counting)	Set to 1 (true) if session finish time < Last case finish time - 30 minutes, otherwise zero (false)	CASE WHEN (DATEDIFF(mi , Session_Finish_Time , Session_Last_Case_Finish) - 30) > 0 THEN 1 ELSE 0 END
Late Finish Mins	From Session Finish to Last Case in Finish with 30 minutes grace period; zero if Late Finish Flag is zero	CASE WHEN (DATEDIFF(mi , Session_Finish_Time , Session_Last_Case_Finish) - 30) > 0 THEN DATEDIFF(mi , Session_Finish_Time , Session_Last_Case_Finish) ELSE 0 END
Early Start Flag (used for counting)	Set to 1 (True) if session start time > first case in anaesthetic, otherwise set to zero (false)	case when (DATEDIFF(mi,Session_Start_Time, Session_First_Case_In_Anaesthetic))<0 then 1 else 0 end
Early Finish Flag (used for counting)	Set to 1 (true) if Session Finish) > Last Case Finish + 30 minutes else set to 0	CASE WHEN (DATEDIFF(mi , Session_Finish_Time , Session_Last_Case_Finish) + 30) < 0 THEN 1 ELSE 0 END
Early Start Mins	From First Case in Anaesthetic to Session Start; zero if Early Start Flag is zero	case when (DATEDIFF(mi,Session_Start_Time, Session_First_Case_In_Anaesthetic))<0 then DATEDIFF(mi, Session_First_Case_In_Anaesthetic, Session_Start_Time) else 0 end
Early Finish Mins	From Last Case in Finish to Session Finish Zero – 30 minutes grace; zero if Early Finish Flag is zero	CASE WHEN (DATEDIFF(mi , Session_Finish_Time , Session_Last_Case_Finish) + 30) < 0 THEN DATEDIFF(mi , Session_Last_Case_Finish , Session_Finish_Time) ELSE 0 END
Single_Double (used for counting)	If session_number = 3 then this is an all day session and counts as 2 sessions (double) else it is a morning or afternoon session and counts as 1 session (single)	CASE WHEN Session_Number = 3 THEN 2 ELSE 1 END
Session Utilisation Category	Funded / Unfunded Open / Closed Planned Closure / Unplanned Closure in various combinations	CASE WHEN Session_Number = 4 THEN 'Unfunded' WHEN (Closure_Group = 'Open' OR Generic_Category_Code = 'REINSTATE') AND D_ACTION <> 'D' THEN 'Funded - Open' WHEN Closure_Group = 'Planned' THEN 'Funded - Closed - Planned' WHEN Closure_Group = 'Unplanned' OR D_ACTION = 'D' THEN 'Funded - Closed - Unplanned' ELSE 'Unknown' END

Theatre Case Calculations

OR Duration	Case Start Actual to Case Finish (In OR to Out OR)	DATEDIFF(mi,Case_Start_Actual,Case_Finish)
Treatment Duration	From In Anaes to Out OR	DATEDIFF(mi,Case_In_Anaesthetic, Case_Finish)
Minutes to Induce Anaesthesia	Time in minutes from (beginning of) Anaesthetic Induction to Anaesthetic Ready (patient anaesthetised)	DATEDIFF(mi,Case_Anaesthetic_Induction,Case_Anaesthetic_Ready)
Cancelled Within A Day	Set to 1 when a cancellation is entered less than 2 days prior to the proposed operation date (hence this also includes cancellations after the fact). Otherwise zero. Note: 0s and 1s are good for adding up counts!	CASE WHEN DATEDIFF(dd, Case_Cancellation_Date_And_Time_Of_Cancellation, Case_Cancellation_Date_Of_Operation) >1 THEN 0 ELSE 1 END
Anaes Ready to KTS	Special request by Robbie	DATEDIFF(mi, Case_Anaesthetic_Ready,Case_First_Incision)
Case Hour	The hour when the patient commences anaesthetic induction	CASE WHEN dbo.ORM_FOPERAT.OP_START_DATE_TIME IS NULL THEN 0 ELSE DATEPART(hh , dbo.ORM_FOPERAT.OP_ANAES_IND_DATE_TIME) END

Procedure Calculations

Procedure Duration	From Procedure Start to Procedure Finish	DATEDIFF(mi,Case_Procedure_Start,Case_Procedure_Finish)

Notes

Session Data Items

Session Number:

This is the 'type' of session. It is used originally to generate the template, and hence the timetables. System operators can input the type of any given session, as a 'session number'.

Session numbers should be allocated as follows:

- Enter 1 for a funded, morning-only session
- Enter 2 for a funded, afternoon-only session
- Enter 3 for a funded, all day session
- Enter 4 for an unfunded session

Emergencies during an elective session DO count to session duration (Lukianski 25 Jan) Total ops count during a session, regardless of op type

DQ ops done in closed session – does the time taken count for KPI calculation? If so, how – given that the session has zero length (being closed)