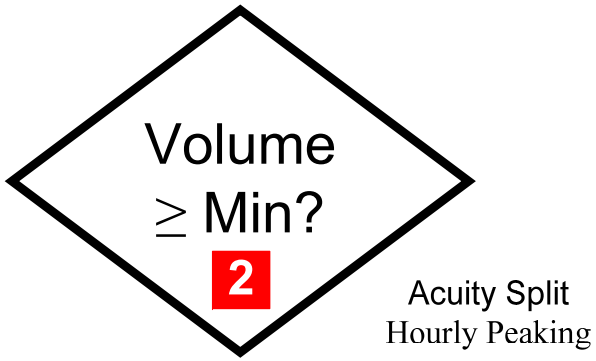
Minimum Volume Requirement Tool



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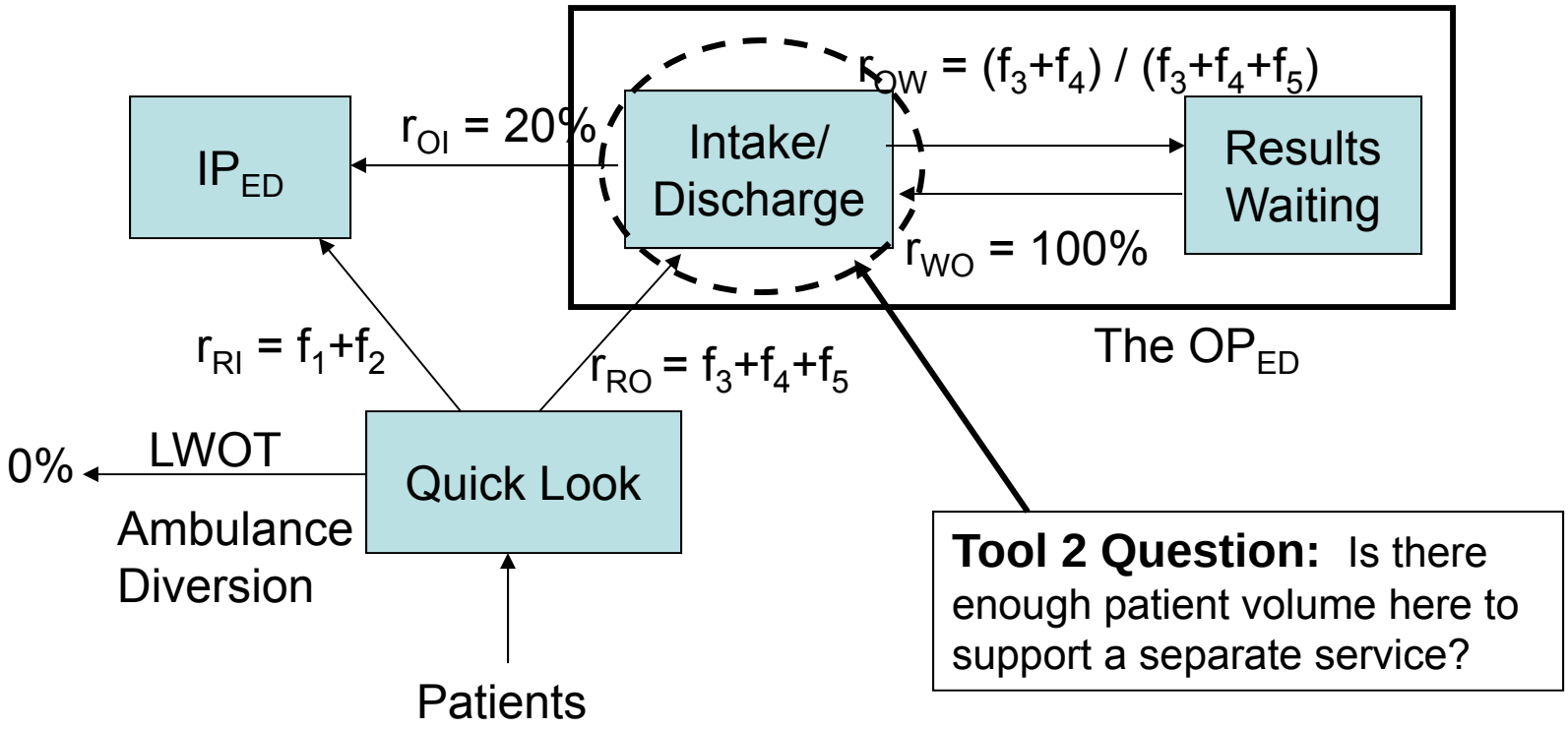
Analysis Goals

- With this tool, the user will be able to answer the question: “Is my facility’s volume sufficient to support a Split Flow process?”
- This decision is based on a forecasted planning volume, patient acuity mix (f_1, f_2, f_3, f_4, f_5), and assumed average service times.

The Central Concept – 'Two EDs in One'

- After a Quick Look registration, patients travel to either the IP_{ED} or the OP_{ED} side, depending upon acuity
  - In the IP_{ED}, all resources come to the patient in a bed according to traditional clinical practice.
  - In the OP_{ED}, the patient moves among treatment areas, rarely in front of a doctor, for example, not while awaiting test results or during hydration.
- Patient splitting is based on an ESI-like acuity scale where Level 1 and 2 patients go directly to the IP_{ED} and Level 3, 4, and 5 patients are initially routed to the OP_{ED}.
- Some Patients will be 'upgraded' from OP_{ED} to IP_{ED}.
- The next slide shows the OP_{ED} and IP_{ED} Split ED areas graphically.

Splitting Patient Flow



- Here r_{IJ} is the fraction of patients who flow from area I to area J. Recall that patient acuity mix is defined as (f_1, f_2, f_3, f_4, f_5) and used for the initial split.
- Patients of acuity 5 visit only the OP_{ED} Intake/Discharge area. Patients of acuity 3 and 4 visit Results Waiting and Intake/Discharge (on the way in and out).
- From clinical experience, typically 20% of OP_{ED} patients are 'upgraded' to IP_{ED}.

Tool 2 Inputs

- Yearly Planning Volume
  - This number can be current or future forecasted volume.
  - Hourly volume during the peak period will be determined from this.
- Patient Acuity Mix
  - These numbers determine the routing of patients to IP_{ED} and OP_{ED}.

f_1, f_2: Patients initially routed to IP_{ED}

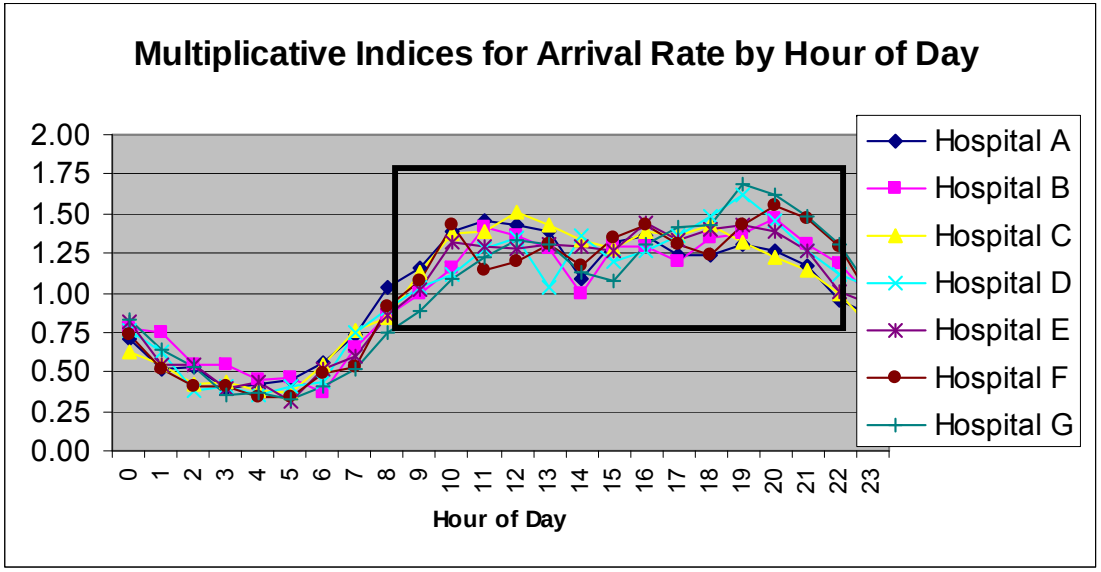
Daily Planning Volume (Including LWOTS)	265
Acuity:	
Level 1 (f_1)	0.03%
Level 2 (f_2)	8.28%
Level 3 (f_3)	68.73%
Level 4 (f_4)	20.53%
Level 5 (f_5)	2.18%
Sum (must equal 100%):	100%

f_3, f_4, f_5: Patients initially routed to IP_{ED} Intake/Discharge

Adjusting for Daily Peaking[1][2]

[1] and [2] are references confirming our time of day peaking study below.

- ED arrival volume patterns (not overall levels) are predictable by hour of the day. For example:



- Volume is stable during the 9 am-9 pm peak at a multiplier (compared to average daily volume) = 1.30

Calculating Tool 2 Output

- Hourly ED Arrivals:
  - The number of patients per hour arriving to the ED during the peak 12 hours

$$Hourly\ ED\ Arrivals = \frac{Daily\ Planning\ Volume}{24} * \left(9\,am - 9\,pm\ Peak\ Multiplier\right)$$

- Arrivals/Hr to Intake/Discharge:
  - All lower acuity patients are either discharged after Intake or upgraded to be transferred to the IP_{ED}.

$$Arrivals\ /\ Hr\ \ to\ Intake\ /\ Discharge = Hourly\ ED\ Arrivals * \boxed{\left[2 * \left(f_3 + f_4 + f_5\right)\right]}$$

Lower acuity patients see a doctor in this area twice.

The EXCEL® Tool 2

Purpose: To determine whether a facility has sufficient volume to support a separate Intake/Discharge area

INPUT:

Daily Planning Volume (Including LWOTS)	265

Acuity:

Level 1 (f_1)	0.03%
Level 2 (f_2)	8.28%
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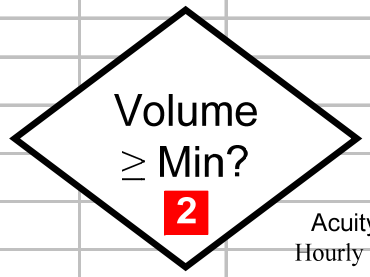


Acuity Split
Hourly Peaking

OUTPUT:

Annual Planning Volume	96700

Time of Day	Peak Multiplier	Hourly ED Arrivals	Arrivals/Hr to Intake/Discharge
Peak Period (9am-9pm):	1.30	14.4	26.2

← In this cell, Green indicates that at least one Intake provider is required (several may actually be required). If the cell is Red, then volume is insufficient.

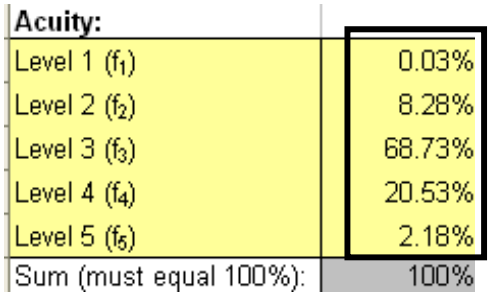
NOTE: Assumed average length of stay in Intake = 15 min., average length of stay in Discharge = 7.5 min.

Using Tool 2 Results

- An average hourly Intake/Discharge volume of > 4.05 patients will support a single doctor at 70% utilization during the peak hours which provides good door-to-doc times.
- If your results cell is green, at least one provider is required on the OP_{ED} side. Tool 5 will estimate how much space is required and Tool 6 how many providers.
- If the results cell is red, implementing split flow is more complicated. Although there is not enough business to keep the area fully busy, the principle of 'patients do not own a bed' can still be used and lower acuity patients may wait for results or be hydrated in waiting spaces rather than full service IP_{ED} beds. These ideas have been implemented by individual physicians and hospitals, but are not directly supported by this Toolkit.

Links to Next Tools

- Re-enter, don't copy and paste, Patient Acuity Mix into 3 4 5
  - Needed to divide patient flow



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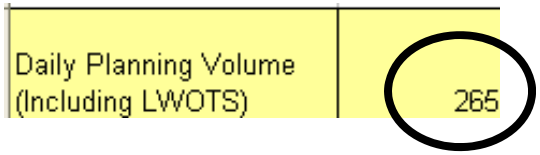
- Re-enter, don't copy and paste, Daily Planning Volume into 5
  - Used to capacitate areas in the Split Flow model



Daily Planning Volume (Including LWOTS)	265

References

[1] Green LV, Soares J, Giglio JF, Green RA. Using queueing theory to increase the effectiveness of emergency department provider staffing. *Academic Emergency Medicine* 2006;13:61-68.

[2] HealthTech Briefing Report. Key trends in emergency and trauma services. *Health Technology Center* Oct 2006. http://www.healthtechcenter.org/.