Target Failure Rate

Definition

> The **target failure rate** (*p_0*) in cusum_analysis is a predefined acceptable rate of failure for a procedure. It acts as a baseline against which a trainee's performance is compared. Deviations from this rate help determine learning progression or performance issues.

It must be set **realistically** based on clinical standards, published data, or institutional benchmarks.

How to Choose a Target Failure Rate

Factors to consider:

- Literature-based complication rates
- Internal quality data from experienced clinicians
- Complexity of the procedure
- Training stage (novice vs expert-level target)

Examples

Procedure	Target Failure Rate (p_0)	Notes
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lumbar_puncture	10–20%	Includes traumatic taps or supervisor takeover
central_line_insertion	5–10%	Includes failed placement, arterial puncture
intubation (1st pass)	10–20%	Setting-dependent: OR vs ED vs ICU
ube_lumbar_discectomy	10–15%	Includes incomplete decompression or conversions
laparoscopic_cholecystectomy	5%	Conversion to open, bile leak, etc.

In the CUSUM Formula

\[S_i = S_{i-1} + (X_i - p_0) \] Where:

- **X_i =** 1 for failure, 0 for success
- **p_0 =** target failure rate (e.g., 0.20 = 20%)
- **S_i =** cumulative sum at procedure *i*

⚠ Pitfalls in Choosing p_0

- Setting *p_0* **too low** = premature labeling of underperformance
- Setting *p_0* **too high** = failure to detect real learning issues
- It should reflect a **balance between ideal and realistic**