2025 EEMEA SCIENTIFIC SEMINARS

Accreditation and the Haemostasis Lab

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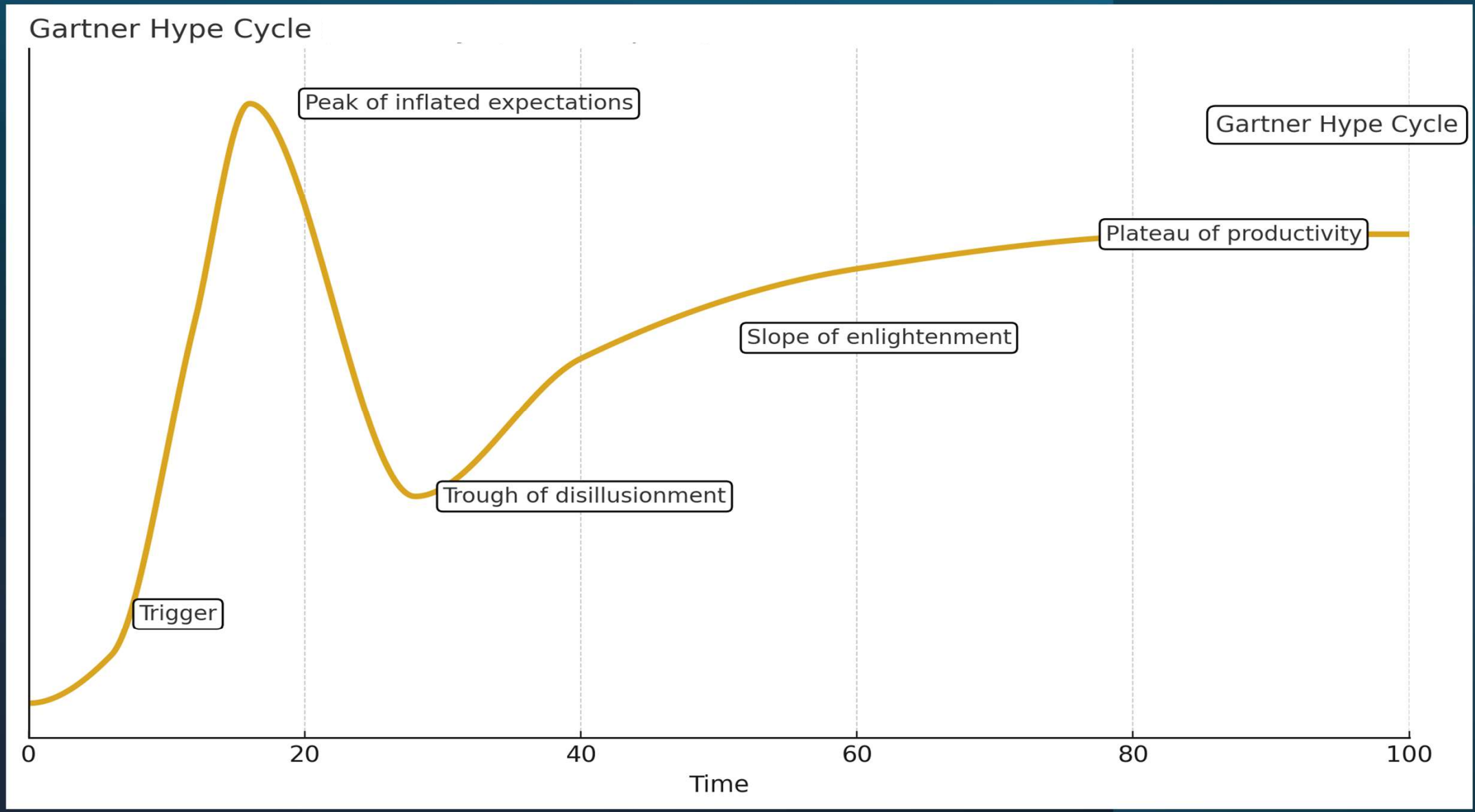
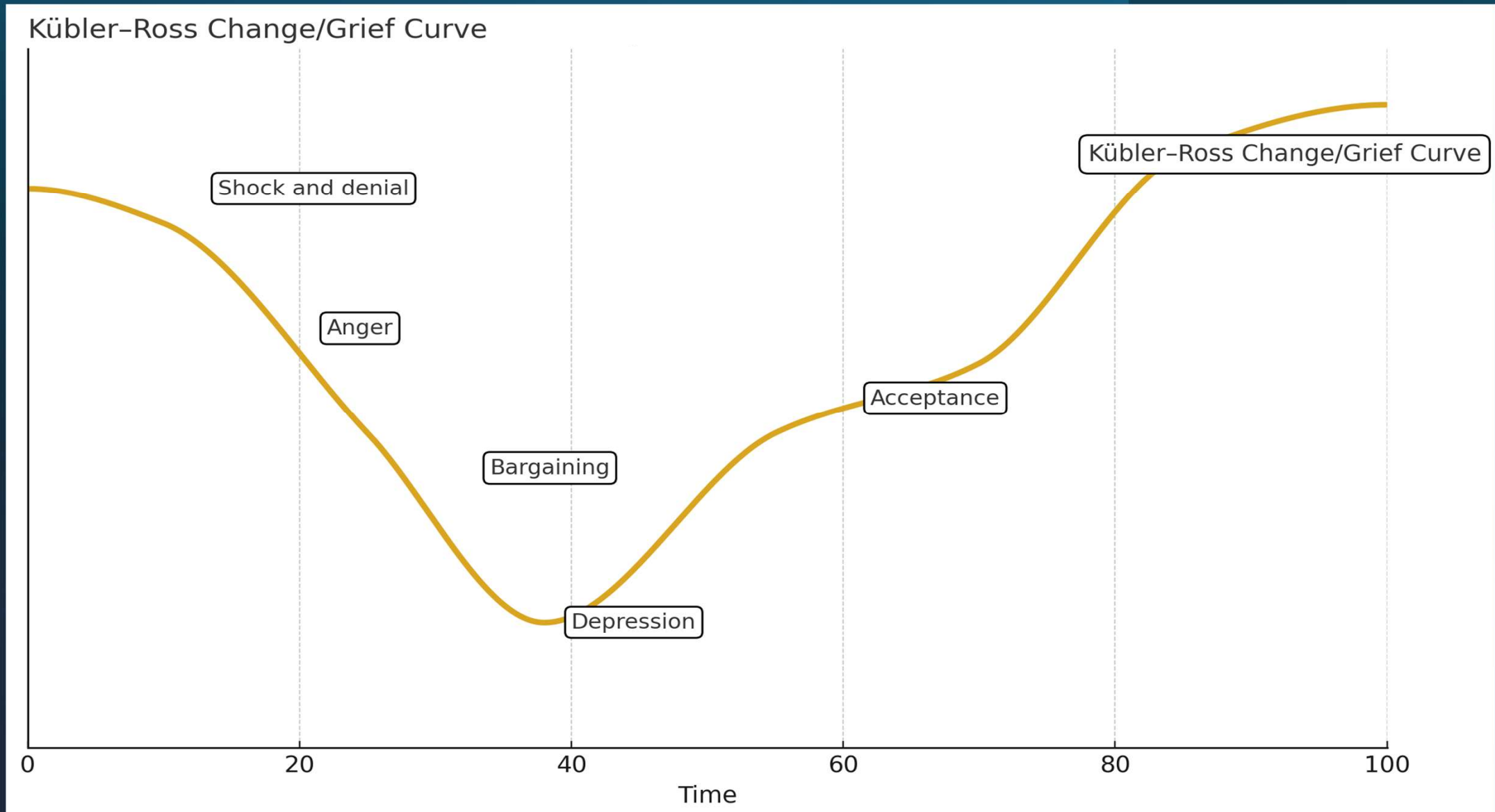
Cambridge University Hospitals NHS Foundation Trust

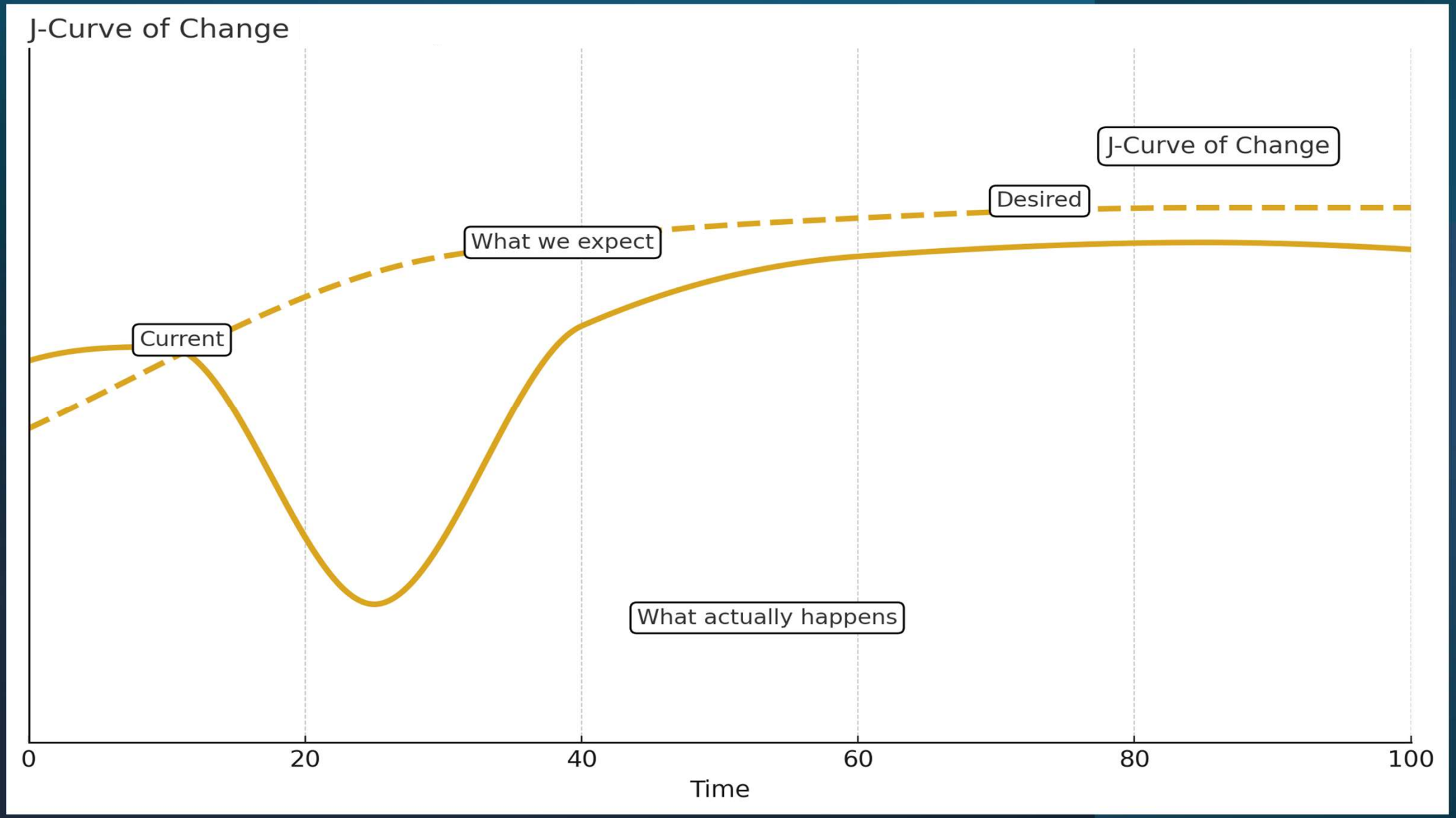
16th Advanced Hemostasis Seminar

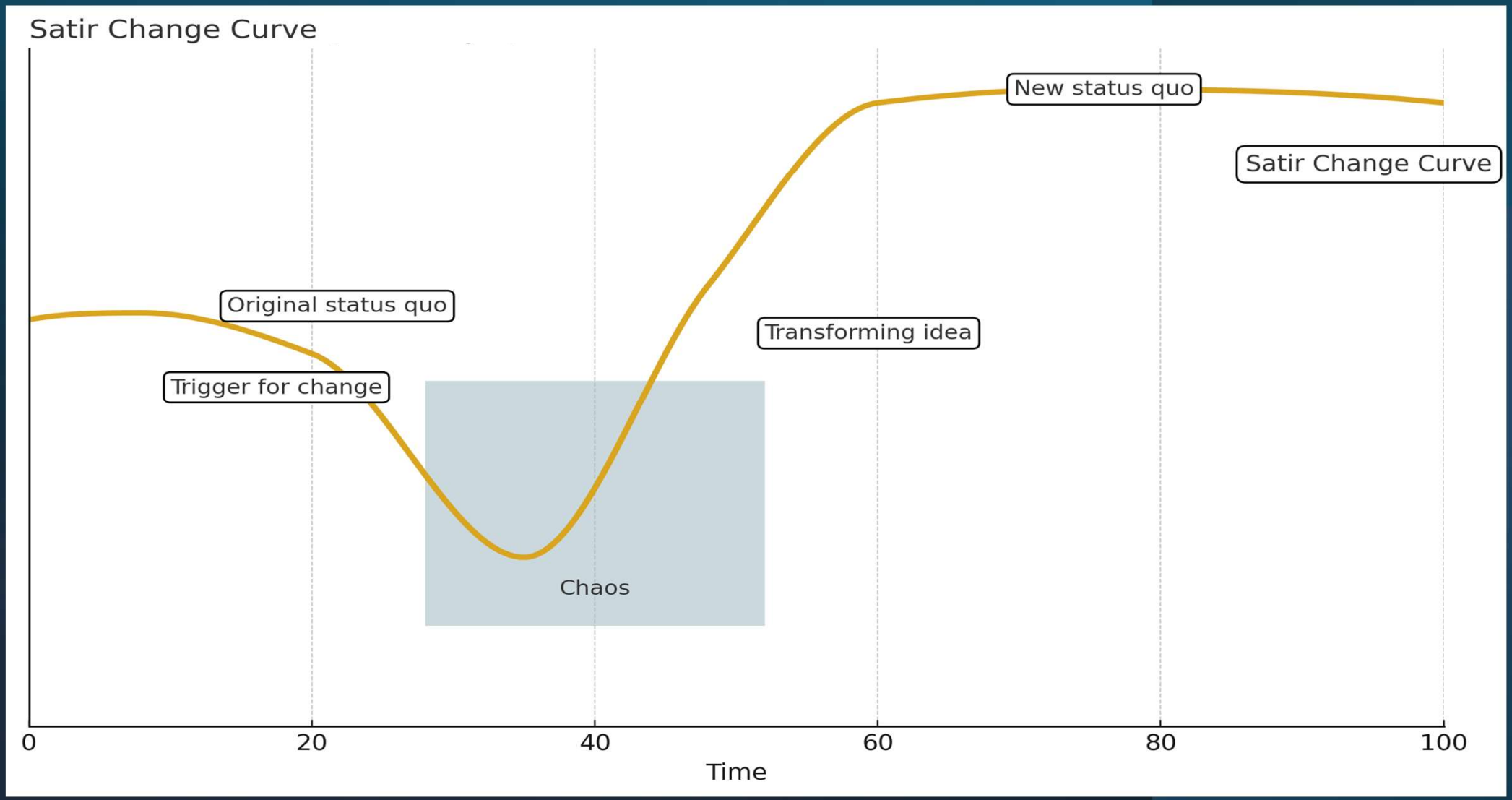
October 14-15, 2025 • Vilnius

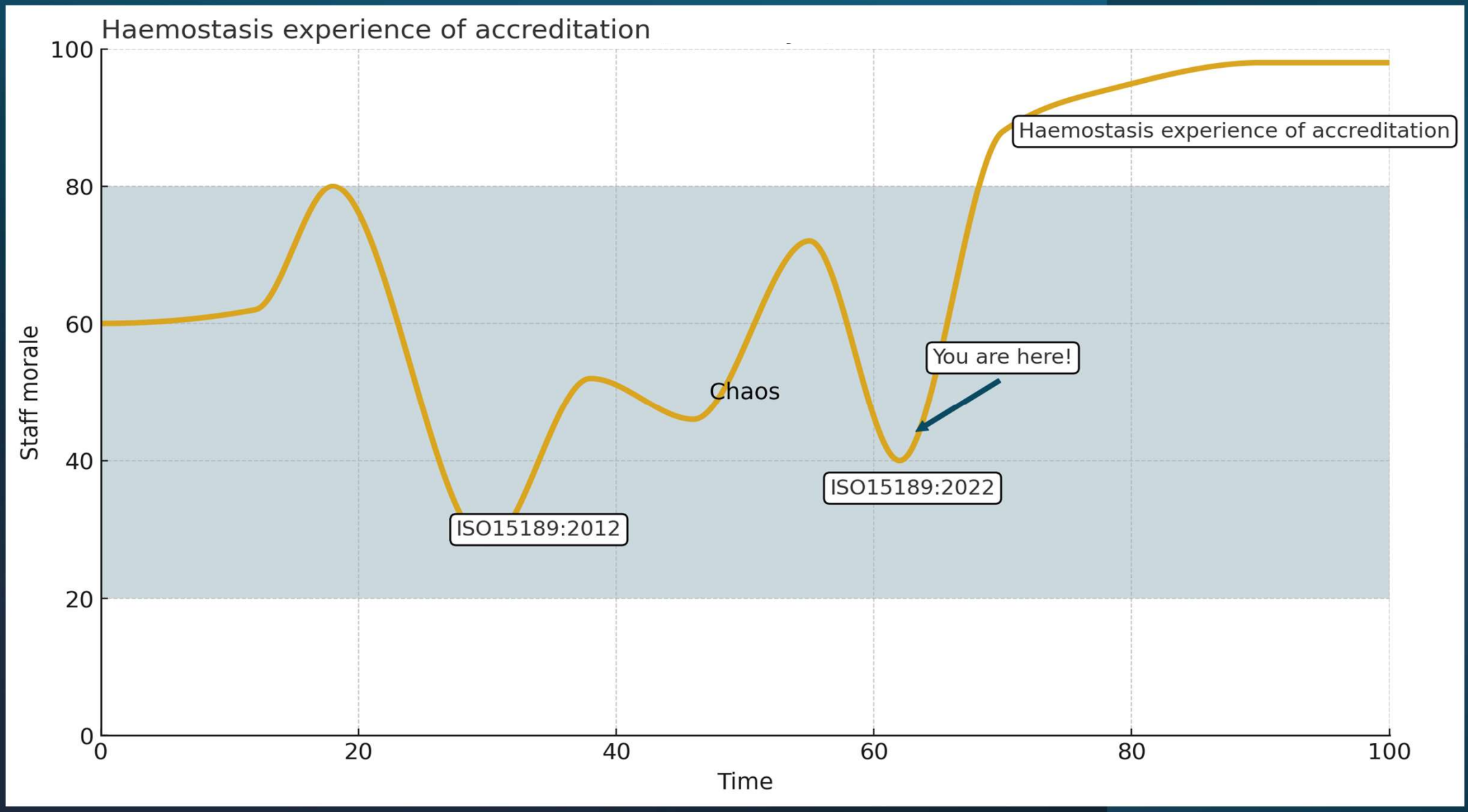
werfen

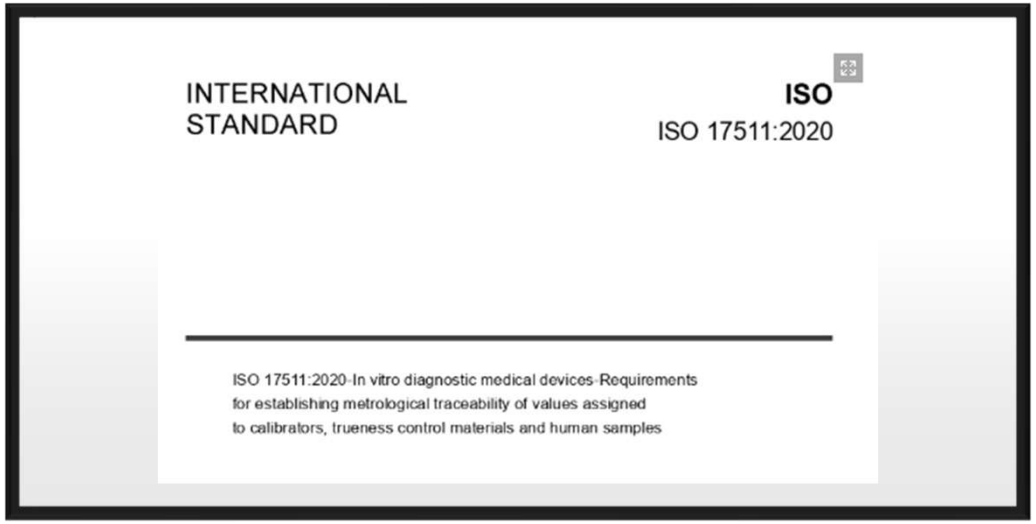

Gartner Hype Cycle
Peak of inflated expectations
Gartner Hype Cycle
Plateau of productivity
Slope of enlightenment
Trough of disillusionment
Trigger
0
20
40
60
80
100
Time


Kübler–Ross Change/Grief Curve
Shock and denial
Anger
Bargaining
Depression
Acceptance
Kübler–Ross Change/Grief Curve
0
20
40
60
80
100
Time


J-Curve of Change
J-Curve of Change
Desired
What we expect
Current
What actually happens
0
20
40
60
80
100
Time


Satir Change Curve
New status quo
Satir Change Curve
Original status quo
Transforming idea
Trigger for change
Chaos
0
20
40
60
80
100
Time


Haemostasis experience of accreditation
Staff morale
Time
0
20
40
60
80
100
Haemostasis experience of accreditation
You are here!
Chaos
ISO15189:2012
ISO15189:2022


INTERNATIONAL STANDARD

ISO

ISO 17511:2020

ISO 17511:2020-In vitro diagnostic medical devices-Requirements for establishing metrological traceability of values assigned to calibrators, trueness control materials and human samples

INTERNATIONAL STANDARD

ISO 22367

First edition
2020-02

Medical laboratories — Application of risk management to medical laboratories

Laboratoires de biologie médicale — Application de la gestion des risques aux laboratoires de biologie médicale

TECHNICAL SPECIFICATION

ISO/TS 20914

First edition
2019-07

Medical laboratories — Practical guidance for the estimation of measurement uncertainty

Laboratoires médicaux — Lignes directrices pratiques pour l'estimation de l'incertitude de mesure

INTERNATIONAL STANDARD

ISO 15189

Third edition
2012-11-01

Corrected version
2014-08-15

Medical laboratories — Requirements for quality and competence

Laboratoires de biologie médicale — Exigences concernant la qualité et la compétence

Fault Tree Analysis (FTA)

Failure modes effects analysis (FMEA)

Process mapping

Baseline risk

Risk mitigation

Residual risk

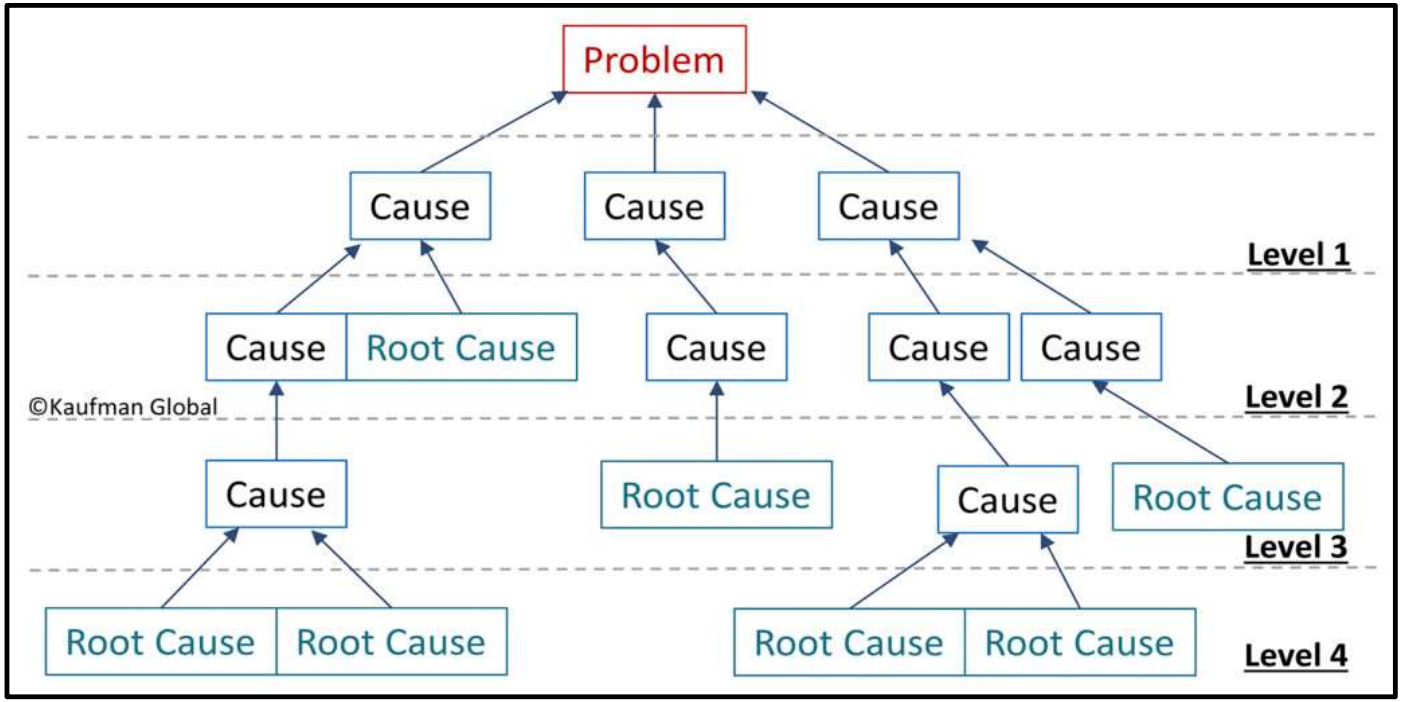
“TOP EVENT” – UNDESIRED CONSEQUENCE

STEPWISE IDENTIFICATION - TOP-DOWN

LOGICAL OPERATORS

PICTORIAL REPRESENTATION

COMPLEX TREES



https://www.kaufmanglobal.com/glossary/tree-diagram/

Failure Mode Effect Analysis (FMEA)

IDENTIFY FAILURE MODES

ASSIGN SEVERITY RATINGS

ASSIGN OCCURRENCE RATINGS

ASSIGN DETECTION RATINGS

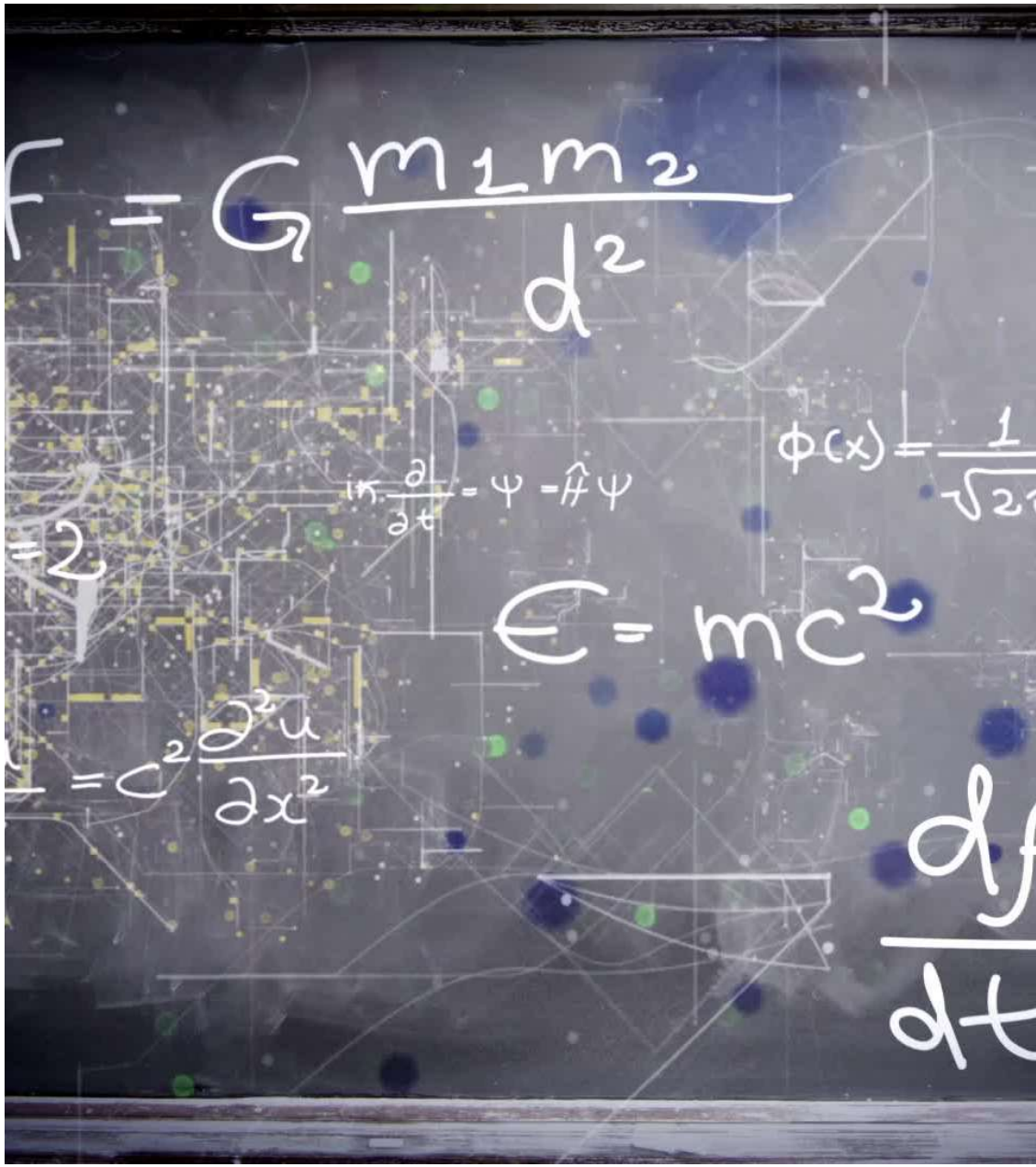
CALCULATE THE RPN

Risk Priority Number (RPN)
= Severity (S) x Occurrence (O) x Detection (D)

Example Calculation:

- Severity (S): 8
- Occurrence (O): 5
- Detection (D): 3

- RPN = 8 x 5 x 3 = 120



Severity Scale

Score	Description	Severity
1	Negligible	No noticeable effect on performance or safety.
2	Minor	Minor effect on performance, no safety issues.
3	Low	Low impact on performance, minor inconvenience to the user.
4	Moderate	Moderate impact on performance, noticeable inconvenience to the user.
5	Significant	Significant impact on performance, potential minor safety issues.
6	High	High impact on performance, potential moderate safety issues.
7	Major	Major impact on performance, potential serious safety issues.
8	Severe	Severe impact on performance, potential for serious injury.
9	Critical	Critical impact on performance, potential for severe injury or system failure.
10	Catastrophic	Catastrophic impact, potential for death or complete system failure.

Probability of Occurence

- Projection from previous data
- Analytical experiments
- Simulation (in silico)
- Published literature
- Expert judgement

Probability of Occurence

Category	CLSI EP23	ISO14971
Frequent	Once a week	>1/1,000
Probable	Once a month	Between 1/1,000 and 1/10,000
Occasional	Once a year	Between 1/10,000 and 1/100,000
Remote	Once every few years	Between 1/100,000 and 1/1,000,000
Improbable	Once in a machine lifetime	>1/1,000,000

Detection capability

Score	Description	Detection capability
1	Almost Certain	The failure mode is almost certain to be detected before it causes harm.
2	Very High	Very high likelihood of detection.
3	High	High likelihood of detection.
4	Moderately High	Moderately high likelihood of detection.
5	Moderate	Moderate likelihood of detection.
6	Low	Low likelihood of detection
7	Very Low	Very low likelihood of detection.
8	Remote	Remote likelihood of detection
9	Very Remote	Very remote likelihood of detection.
10	Almost Impossible	Almost impossible to detect the failure mode before it causes harm.

Question to consider

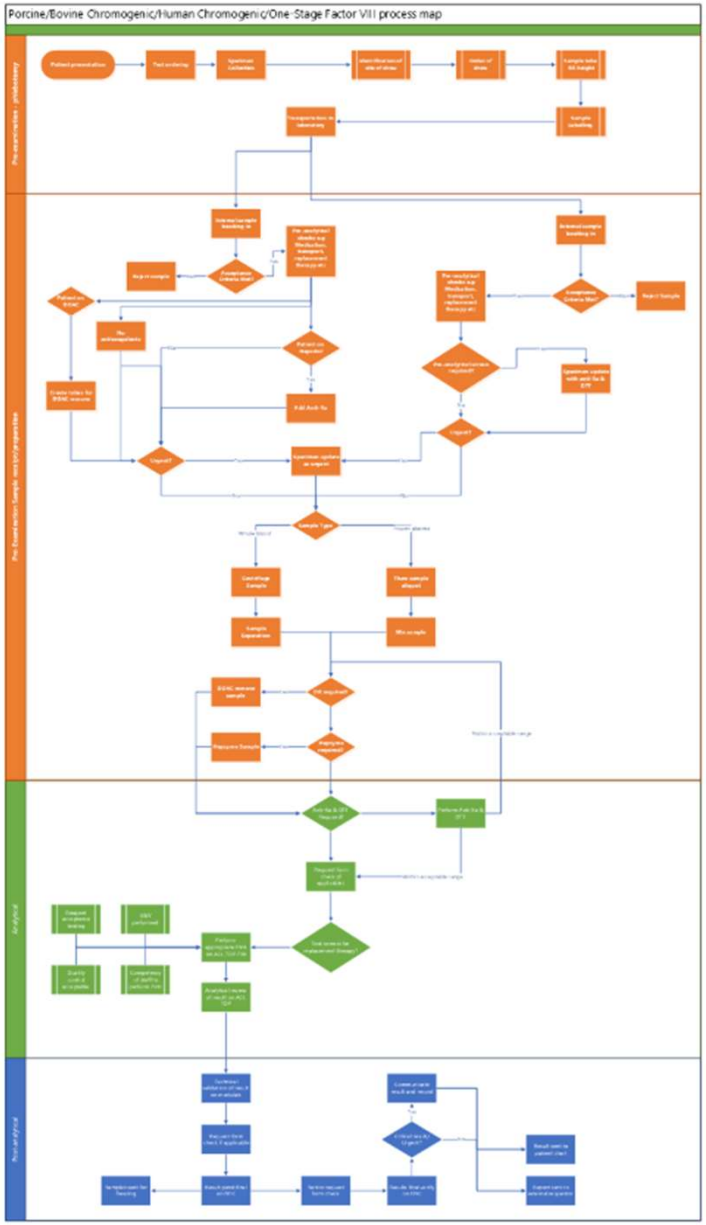
How does your laboratory decide the scales and thresholds for detection ratings?

What criteria do you use to determine when a failure mode requires immediate corrective action based on its detection score?

How do you ensure consistency and accuracy in the detection ratings assigned during the FMEA process?

How do you measure the effectiveness of the corrective actions taken based on the detection scores?

Process mapping



Process Function	Potential failure mode	Potential effects of Failure	Severity Rationale	Severity	Potential causes of failure	Occurrence	Current controls	Detection	Initial Risk Priority number (RPN)	Recommended action	Severity	Occurrence	Detection	Risk Priority number (RPN)
Preparation for sample examination	Sample not DOAC removed	An falsely low FVIII result, which may or may not lead to a clinician making an incorrect medical decision	Patient: 2 Quality: 2	2	Anticoagulant not identified during sample receipt Anticogulant not removed during pre-analytical processing	1	ADD.HAE 9155: DOAC-Remove: Removal of DOACs and Argatroban from citrated samples details process of sample DOAC removal - staff are competency assessed for this process Post DOAC Remove check performed on all samples to ensure anti-xa/DTT below acceptable limit to reduce interference in assay	1	2	No further actions required				0
	Sample not hepzymed	An falsely low FVIII result, which may or may not lead to a clinician making an incorrect medical decision	Patient: 2 Quality: 2	2	Anticoagulant not identified during sample receipt Anticogulant not removed during pre-analytical processing	1	ADD.HAE 4917: Hepzyme - Removal of Heparin from Samples details process of sample heparin remova; - staff are competency assessed for this process Post hepzyme check performed on all samples to ensure anti-xa below acceptable limit to reduce interference in assay	1	2	No further actions required				0
	Sample not centrifuged correctly	Presence of platelets still in the sample resulting in a shortened APTT thus falsely increased FVIII level. This may or may not lead to a clinician making an incorrect medical decision	Patient: 2 Quality: 2	2	Operator failure - failure to select the correct cetrifugation setting	1	ADD.HAE 32094: Sample Reception for Bleeding & Thrombotic Investigation details sample centrifugation of FVIII samples. All staff competency assessed for sample centrifugation.	1	2	No further actions required				0
	Sample separated in to different patients secondary tube	FVIII result issued to the incorrect patient	Patient: 3 Quality: 5	5	Incorrect identification of samples during sample separation	1	ADD.HAE 32094: Sample Reception for Bleeding & Thrombotic Investigation details sample separation of factor VIII samples. All staff competency assessed for sample centrifugation.	1	5	No further actions required				0

Acknowledging Danielle White, Principal Clinical Scientist who performed this study

What does accreditation of haemostasis assays look like in the real world?

C1 — Intended use & pathway
Screen→confirm algorithm (1) including mixing
DOAC gate at entry (2)

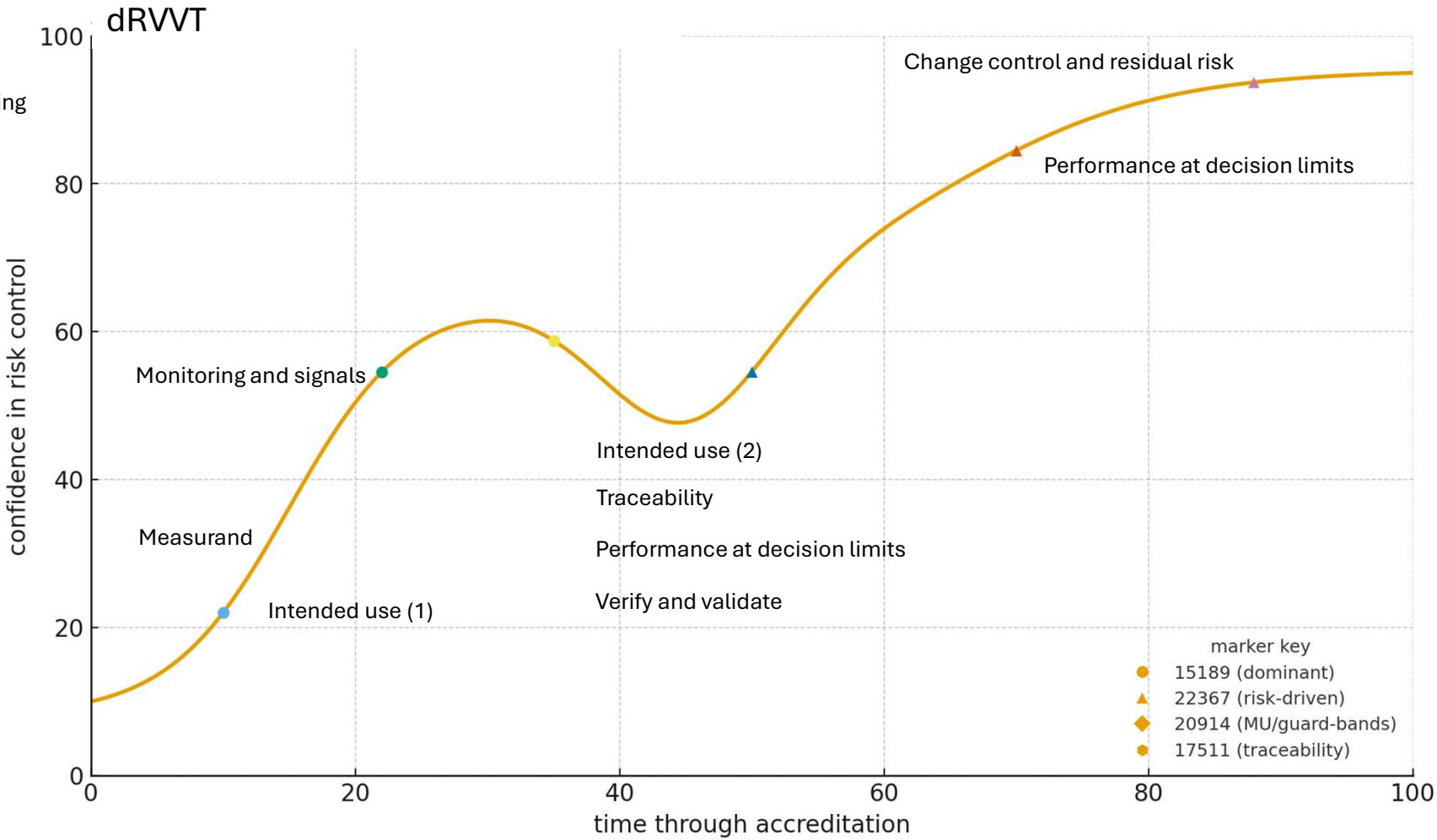
C2 — Measurand & traceability
Whole blood v plasma
Define ratios and correction
Binary reporting

C3 — Verify vs validate
Cut-off verify per lot
Percentile for ref range rationale

C4 — Decision limits
22% correction rule
Charcoal if anti-Xa high

C5 — Monitoring & signals
Daily LA− & LA+ QC
ECAT/UKNEQAS + RCA

C6 — Change control & residual
•SOP & audit DOAC gate
•Residual: undisclosed AC



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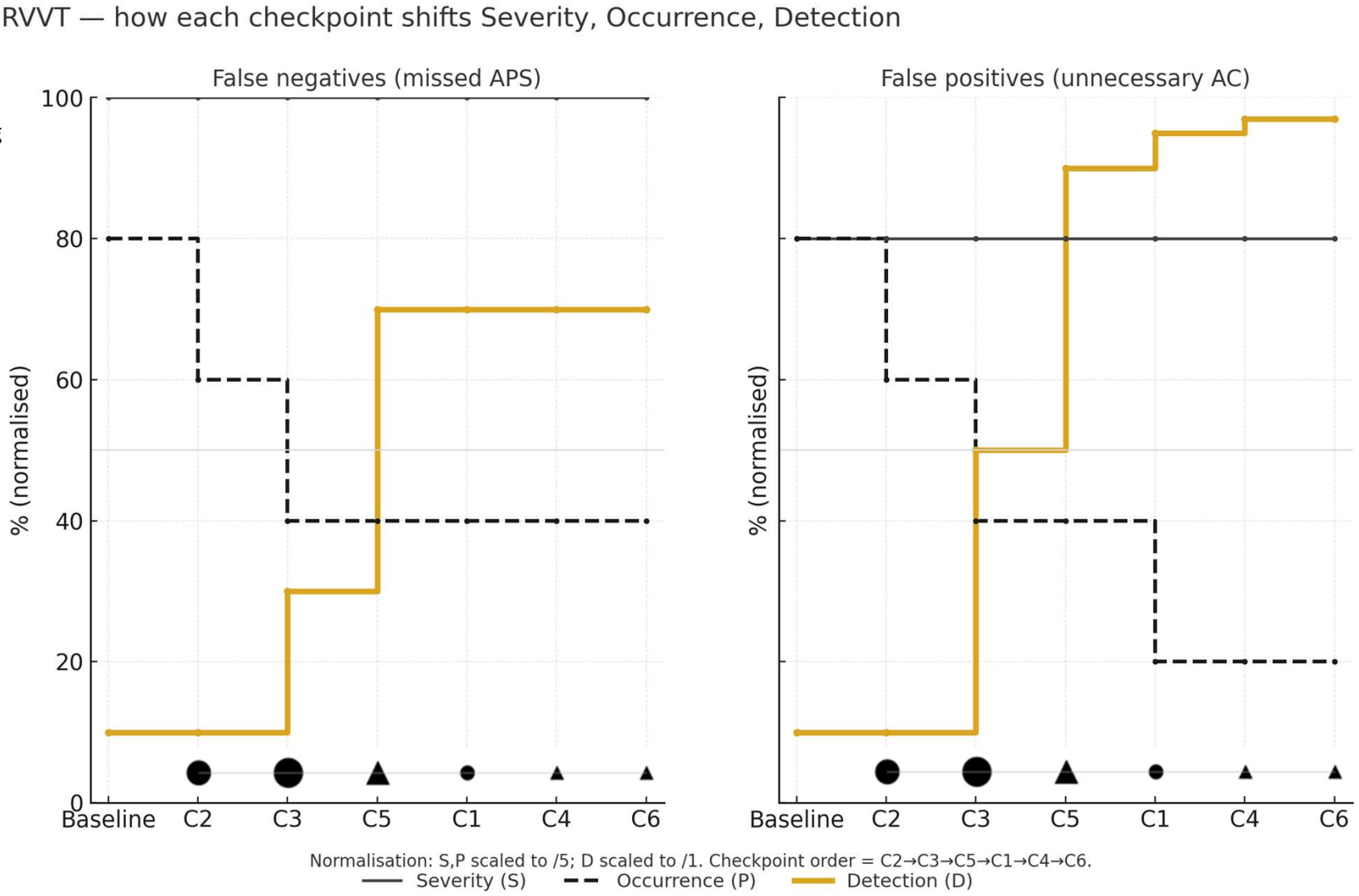

- ISO15189

- ISO22367

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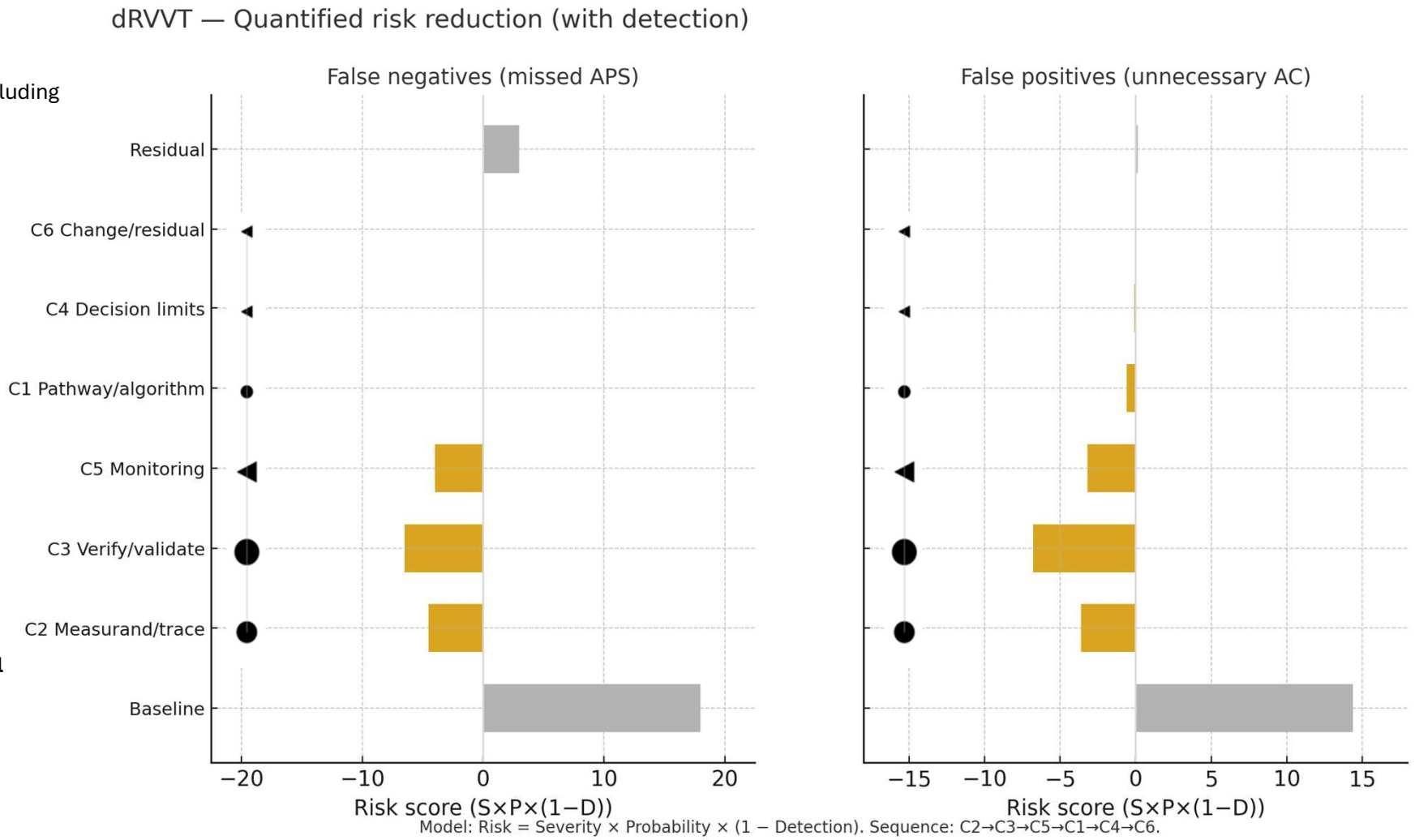

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- ISO22367

C1 — Intended use & pathway
PF4-IgG + 4Ts gate (1)
Reflex to HIPA

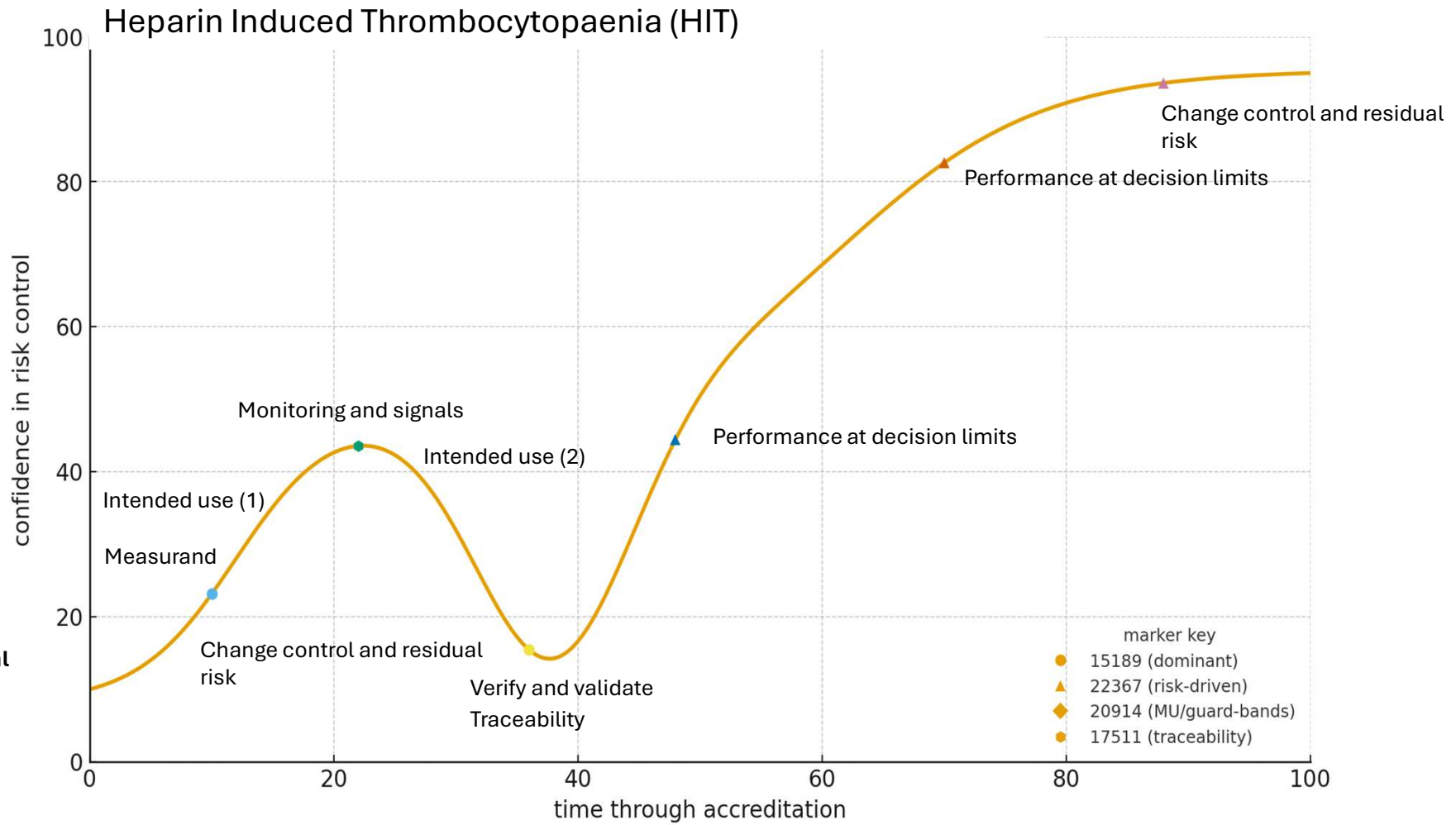
C2 — Measurand & traceability
Method-defined units
No higher-order CRM

C3 — Verify vs validate
Cut-off 1.0→0.3 validated
Pre-set acceptance

C4 — Decision limits
Low pos → functional test
Repeat/clinical review

C5 — Monitoring & signals
Trend % positives
EQA → RCA

C6 — Change control & residual
Reflex ladder embedded
TAT rule for high 4Ts



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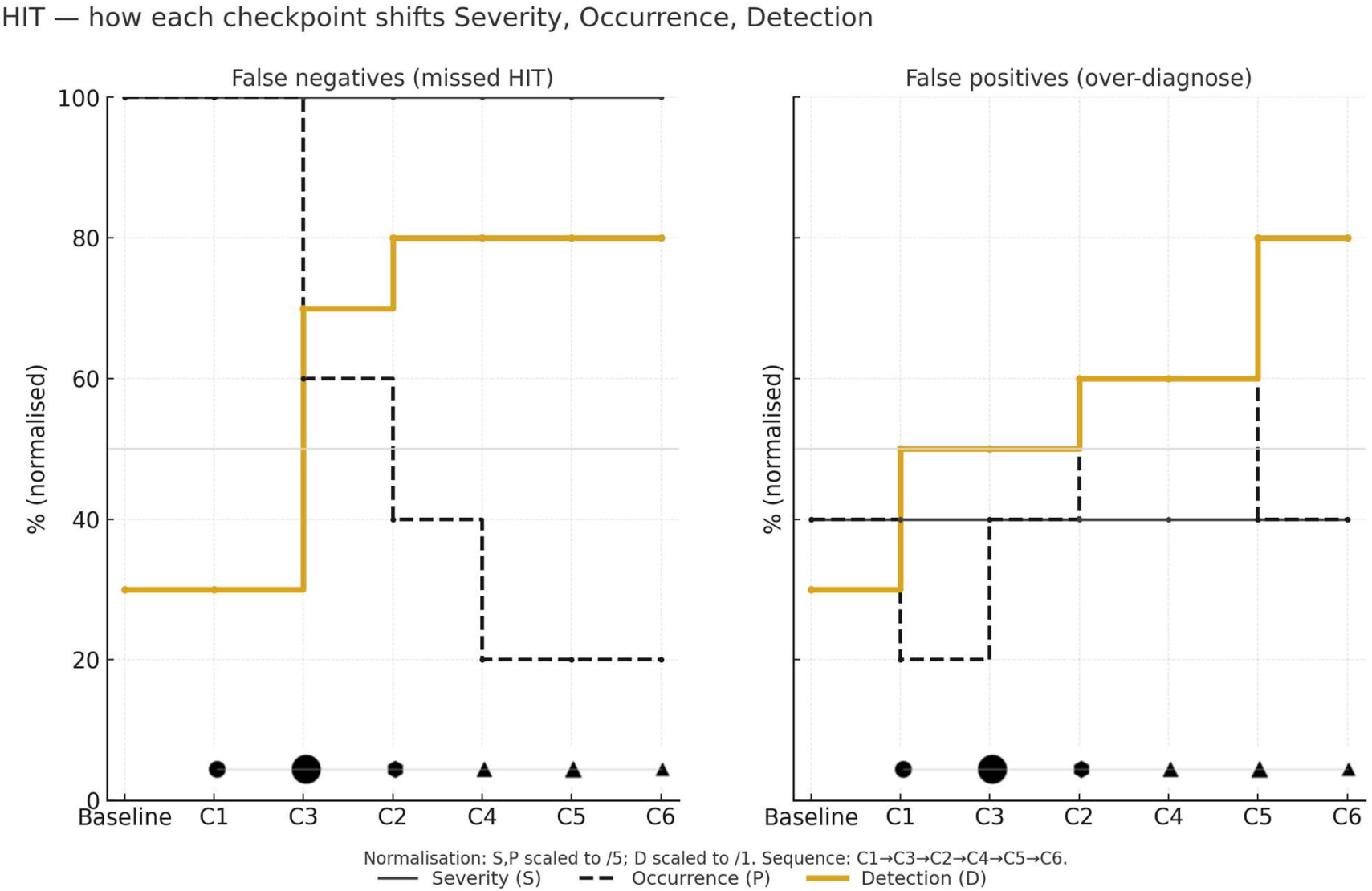

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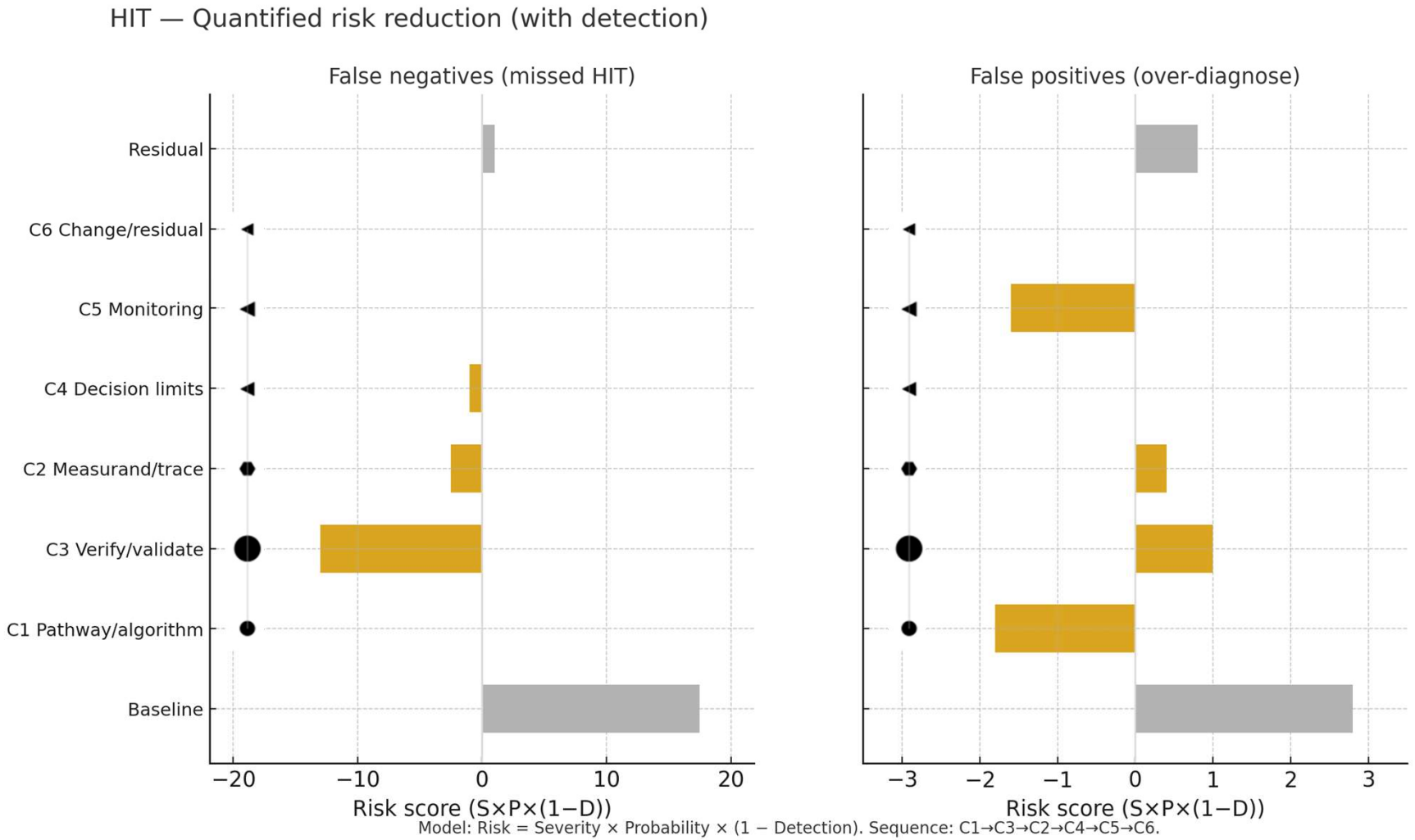


- ISO15189

- ISO22367

C1 — Intended use & pathway
Bleed work-up pathway
Pre-exam drug stop, count

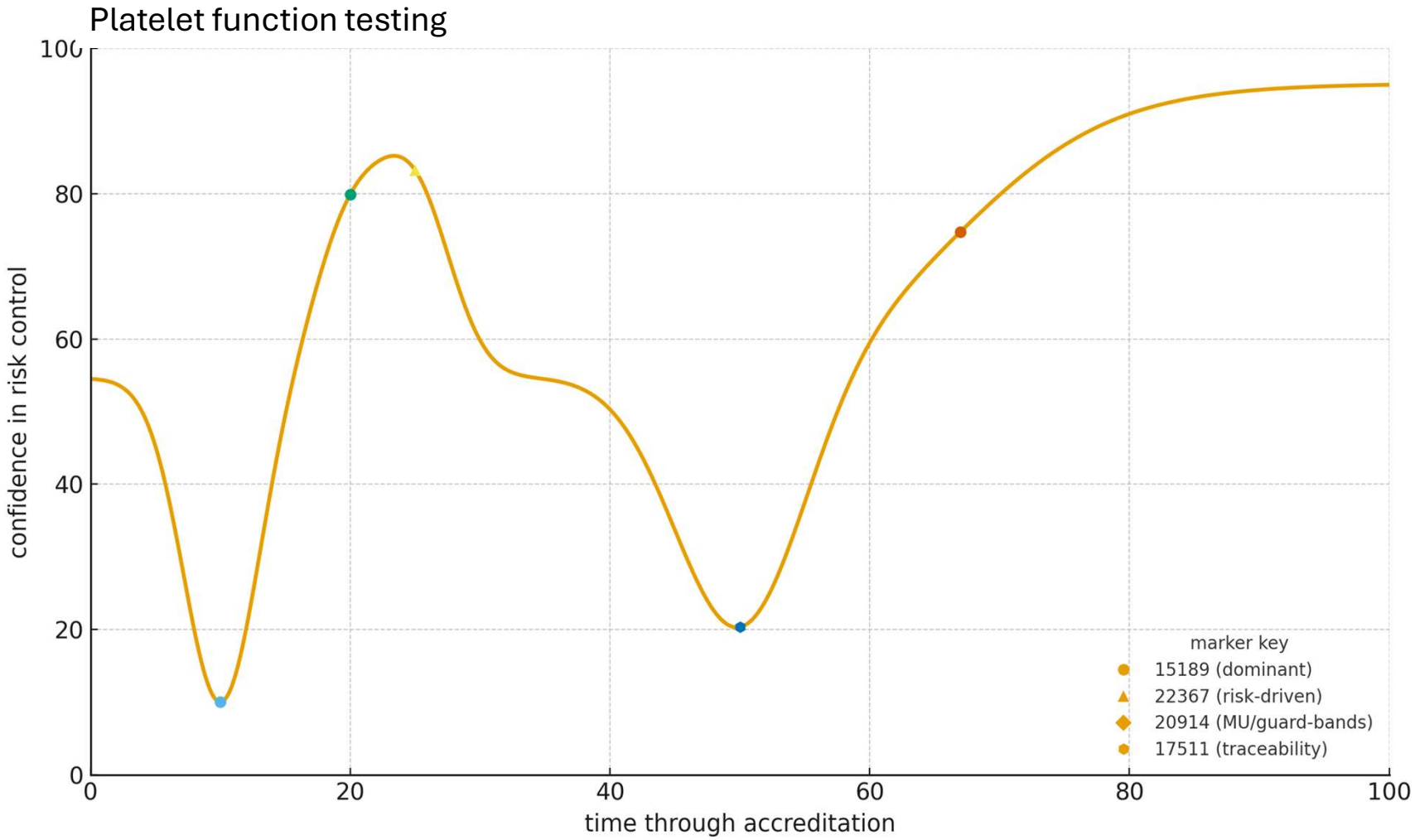
C2 — Measurand & traceability
LTA measurands stated
HPLC ATP/ADP units

C3 — Verify vs validate
Inter-lab sample share
Abnormal IQC material

C4 — Decision limits
Borderline repeat rule
Drug/agonist interferences

C5 — Monitoring & signals
Daily IQC per agonist
EQA scheme adopted

C6 — Change control & residual
Agonist lot verification
Residual risk stated



Footer refs (example): 15189: 7.2, 7.1, 7.3.1–7.3.5, 7.3.7, 7.8; 22367: §5–§7, §10; 17511: §4–§5 (traceability model)

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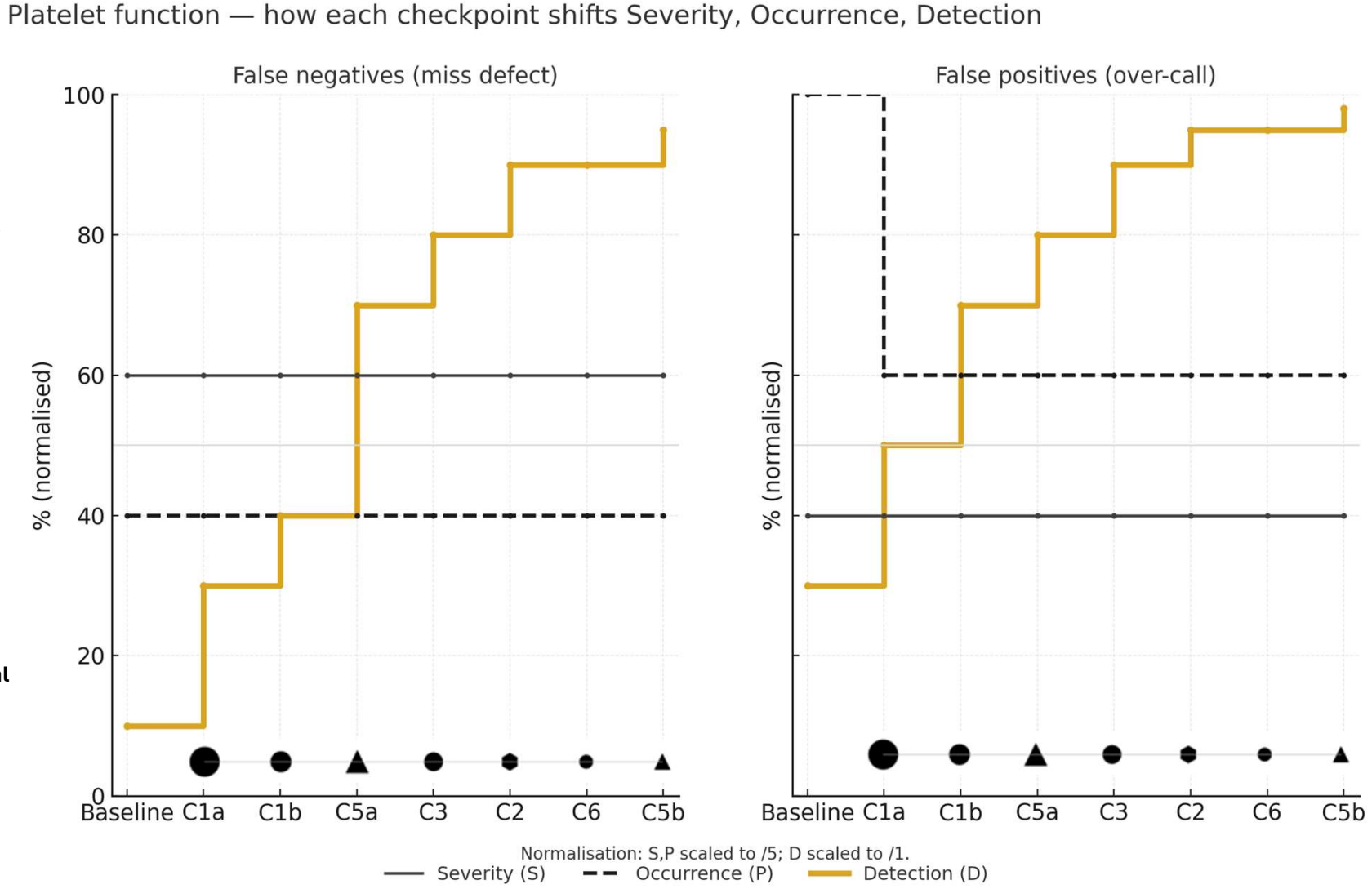

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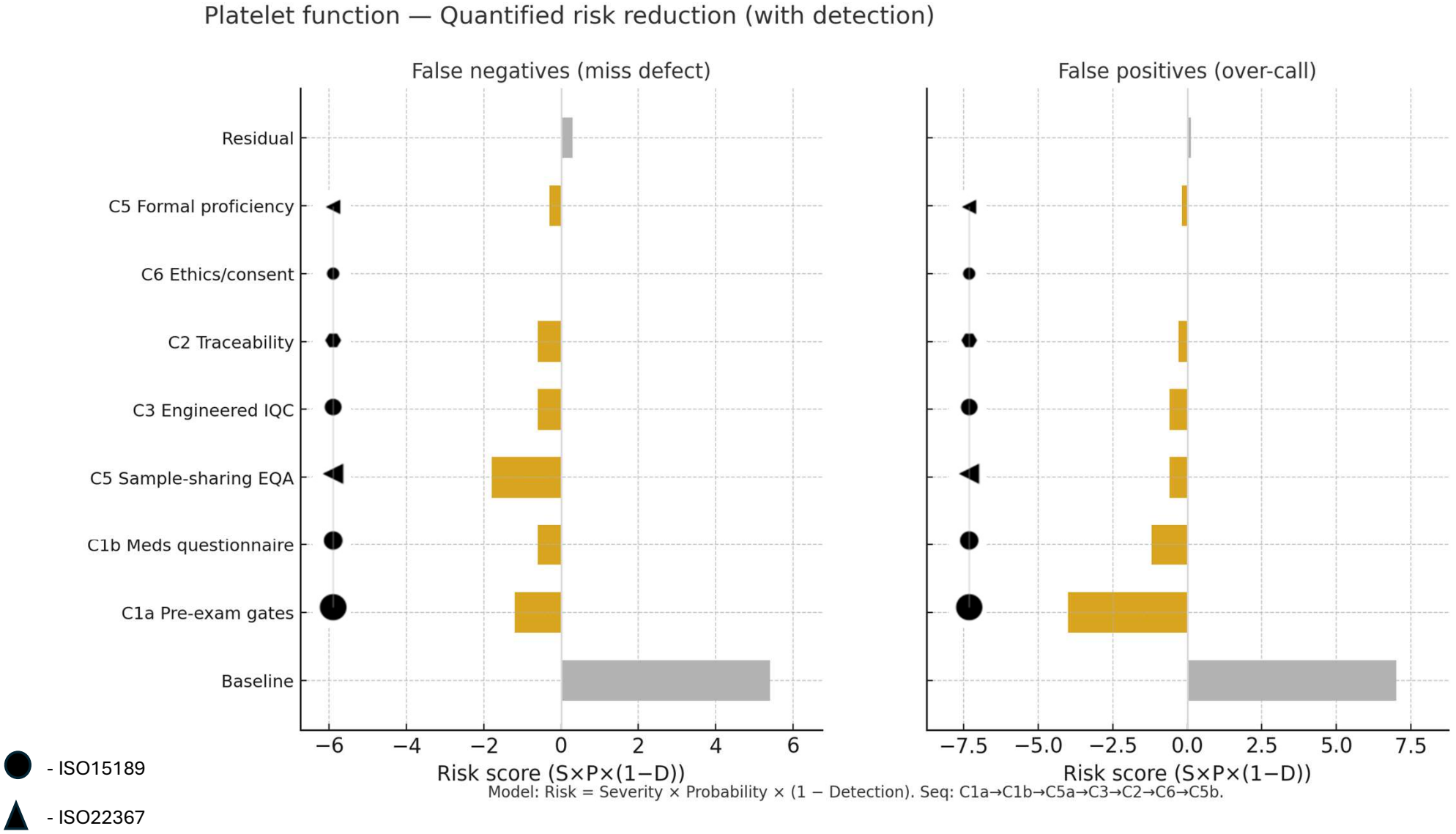

Platelet function — Quantified risk reduction (with detection)
False negatives (miss defect)
False positives (over-call)
Residual
C5 Formal proficiency
C6 Ethics/consent
C2 Traceability
C3 Engineered IQC
C5 Sample-sharing EQA
C1b Meds questionnaire
C1a Pre-exam gates
Baseline
−6
−4
−2
0
2
4
6
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
Risk score (S×P×(1−D))
Risk score (S×P×(1−D))
Model: Risk = Severity × Probability × (1 − Detection). Seq: C1a→C1b→C5a→C3→C2→C6→C5b.
- ISO15189
- ISO22367

C1 — Intended use & pathway
On-drug gate at request
Reflex/interpret text

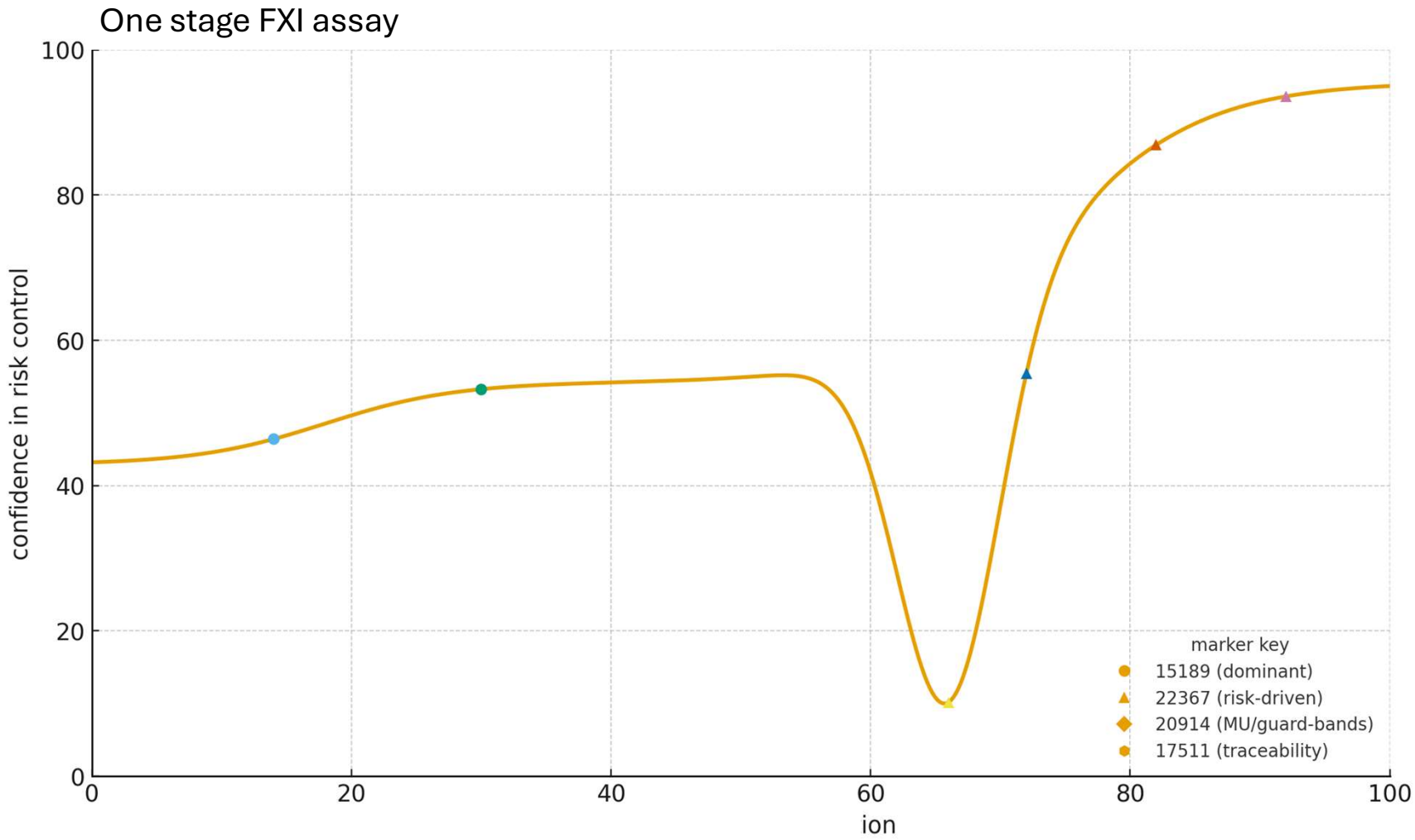
C2 — Measurand & traceability
Reagent sensitivity stated
Measurand limits

C3 — Verify vs validate
Interference verification
Choose reflex policy

C4 — Decision limits
No one-stage on therapy
Use chromogenic

C5 — Monitoring & signals
Audit utilisation
Periodic re-check

C6 — Change control & residual
Interference register
SOP/report updated



C1 — Intended use & pathway
Assay by product
Reflex if discordant

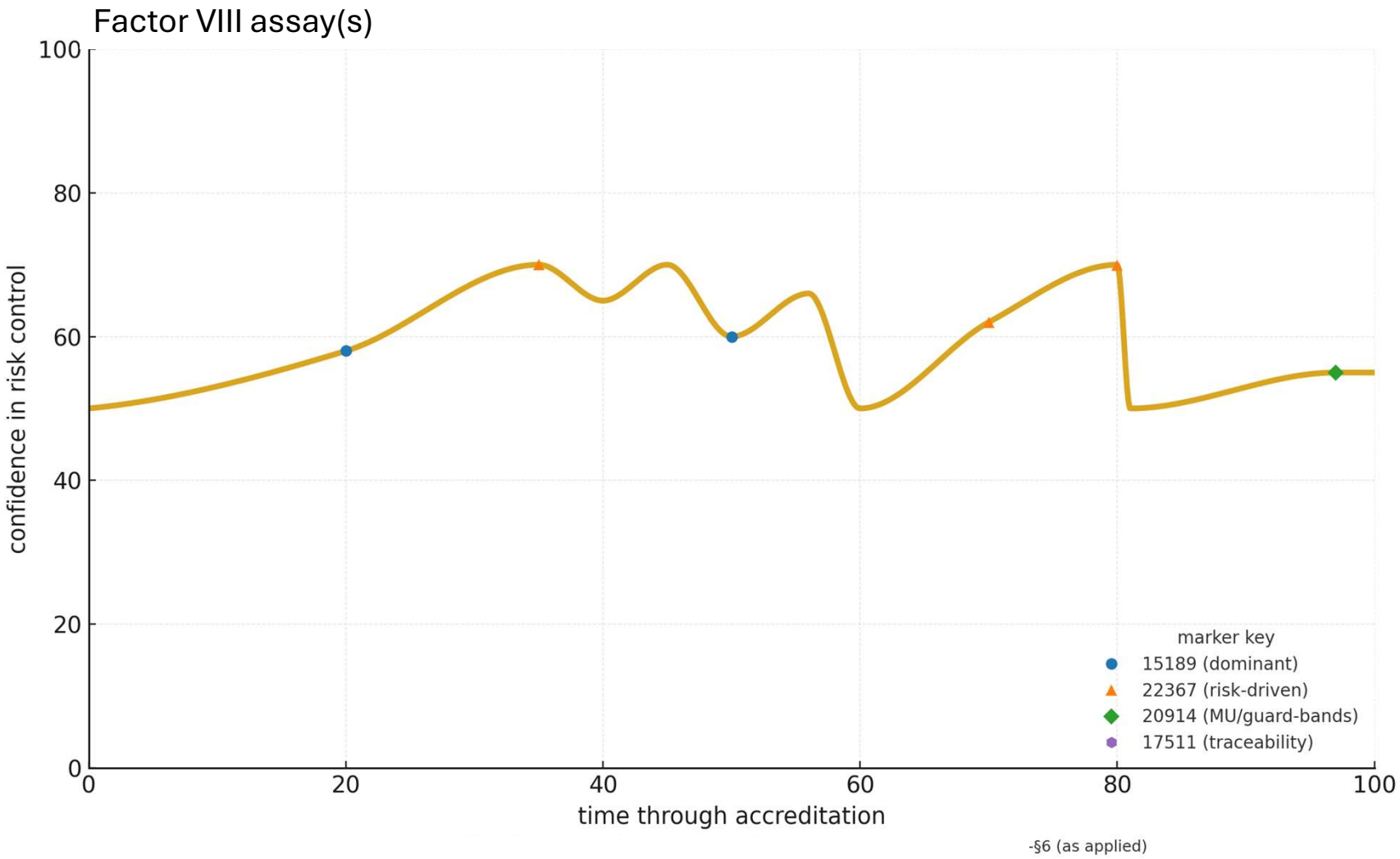
C2 — Measurand & traceability
Define measurands
State commutability limits

C3 — Verify vs validate
Add chromogenic FVIII
Bovine for emicizumab

C4 — Decision limits
Discordance rule set
Guard-bands if used

C5 — Monitoring & signals
Cross-method delta checks
EQA & competence

C6 — Change control & residual
Product–assay matrix
Residual bias declared



-§6 (as applied)

PATHOLOGY IN PRACTICE

RISK MANAGEMENT

Process mapping, FMEA and FTA: practical approaches to risk assessment

Stephen MacDonald continues his new series on the management of risk in the pathology laboratory environment with a look at three practical approaches, process mapping, failure mode and effects analysis, and fault tree analysis.

In this second article, we move beyond concepts and frameworks into the practical tools used to analyse risks. Three key methodologies – process mapping, failure mode and effects analysis (FMEA), and fault tree analysis (FTA) – are essential for systematically evaluating laboratory processes, identifying failure points, and implementing corrective measures.

Process mapping serves as the

RISK MANAGEMENT

Monitoring of lot changes, delta checks, critical results and reference range shifts

In this sixth article in his series, Stephen MacDonald considers the need for a broader, risk-based approach, where monitoring activities are chosen and applied according to the potential for patient harm.

all possible failures. In particular, IQC can be limited by the behaviour of control materials, which may not fully reflect how patient samples respond to analytical changes.

Some analytical shifts occur without triggering IQC alarms, yet still affect patient results. Others may cause changes in QC measurements without altering

QUALITY MANAGEMENT

Risk-based quality control: planning, defining, linking and evaluating

By moving away from fixed quality control schedules and embracing a framework rooted in clinical risk and analytical performance, laboratories can tailor their quality systems to reflect real-world challenges. Here, Stephen MacDonald introduces the role of analytical performance specifications, Sigma metrics, and the MaxE(nuf) model.

they are, and evaluating the severity of potential clinical consequences if errors go undetected. In doing so, the focus shifts from compliance for its own sake to preventing patient harm.

CLSI EP23-A promotes a structured approach that begins with mapping the entire testing process – pre-analytical, analytical, and post-analytical – so that laboratories can systematically identify points of vulnerability – this again sounds familiar from previous articles.

RISK MANAGEMENT

Introduction to risk management frameworks in clinical laboratories

Stephen MacDonald returns to the pages of *Pathology in Practice* with the first in a new series of articles. Here, he begins with an introduction to the subject of management of risk in the pathology laboratory environment.

control (QC), following validated standard operating procedures (SOPs), and continuous competence assessments for laboratory staff. In the post-analytical phase, risks emerge from the interpretation and communication of results. Transcription errors, delays in reporting critical results, or ineffective communication with clinicians can

QUALITY MANAGEMENT

Risk-based turnaround time management: a look at some important issues

In this fifth article in his series, Stephen MacDonald focuses on the implementation of risk-based turnaround time management, which requires collaboration across laboratory and clinical teams, supported by robust IT infrastructure and real-time monitoring tools, and, most importantly, cultural change.

Thanks for listening

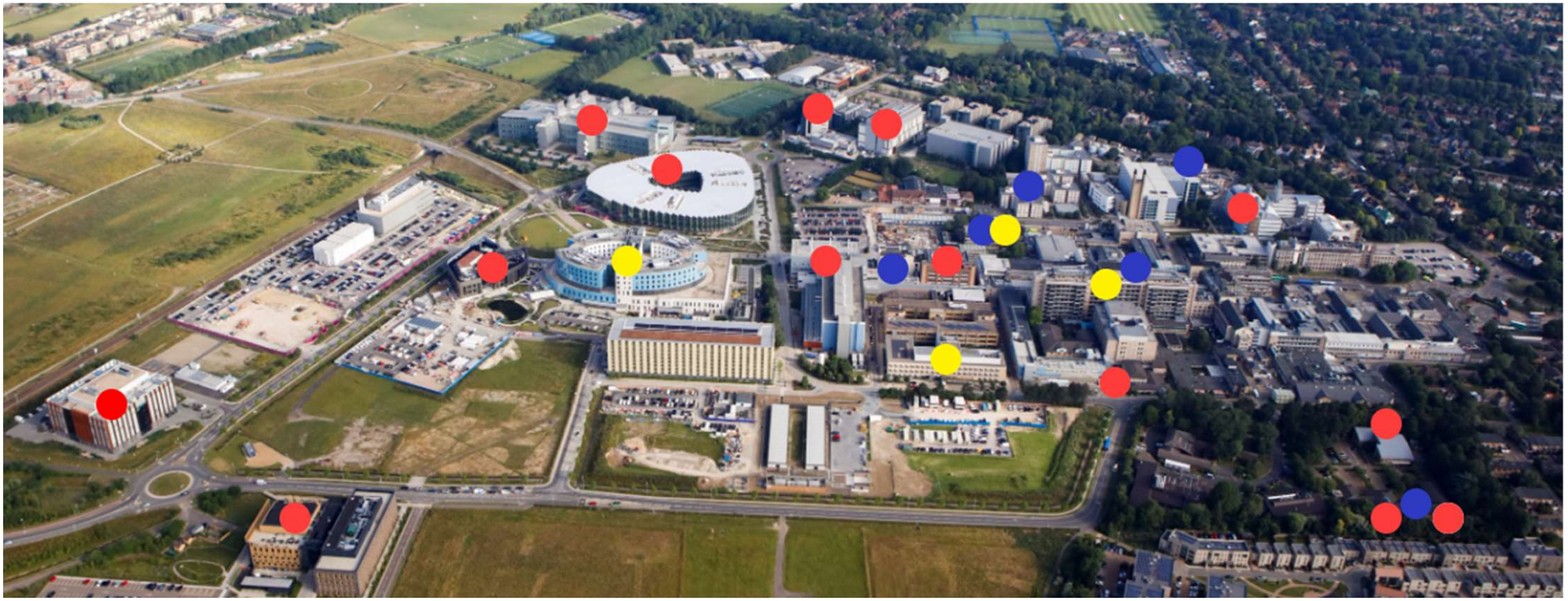
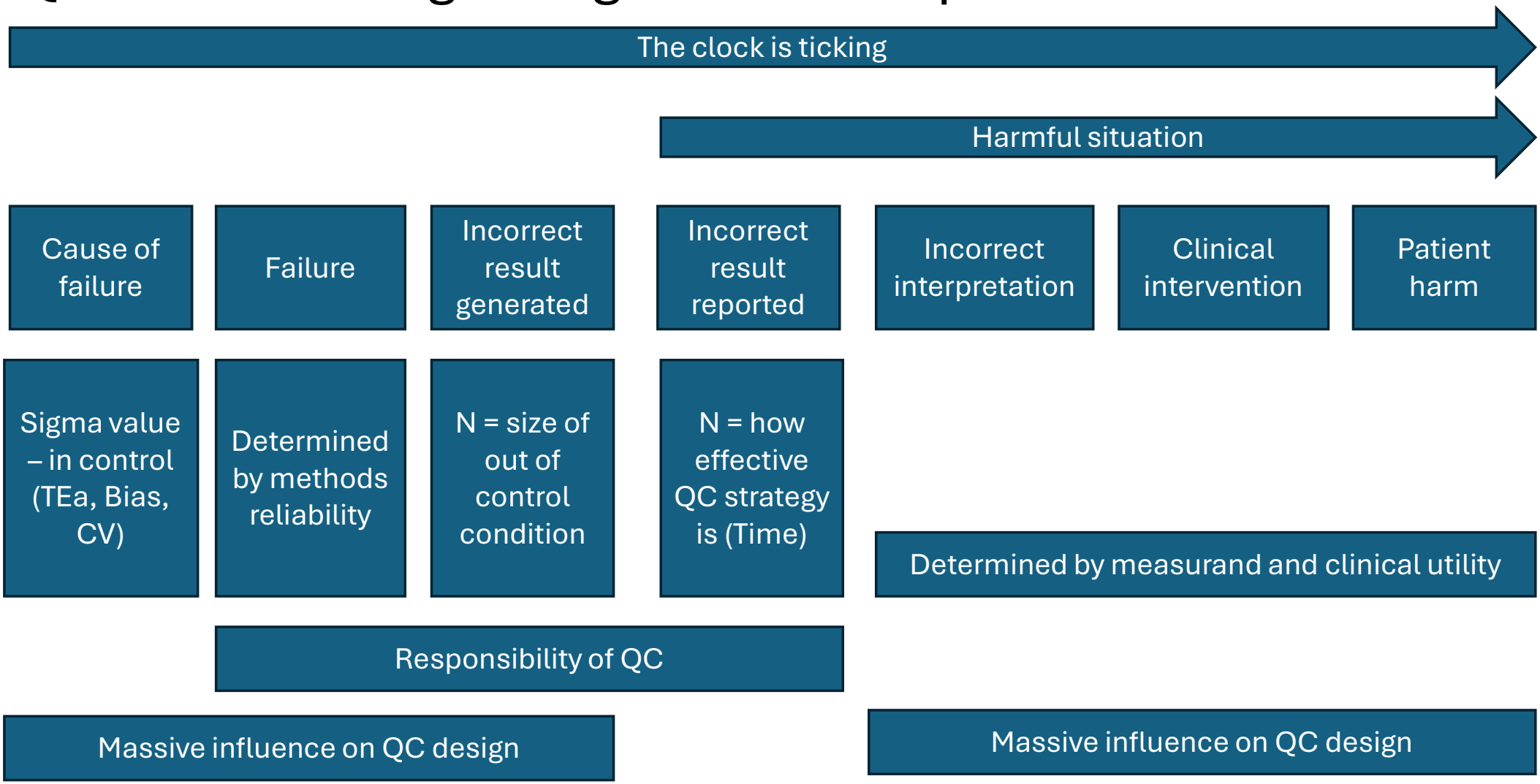


Image modified from: https://cambridgebrc.nihr.ac.uk/contact-us/

QC must be designed right in the first place



Prothrombin Time

Analyst	S MacDonald		
Date	06/12/2024		
Analyser	ACL-TOP 750 CTS		
Test	Prothrombin Time (PT)		
Units	seconds		
Critical decision level			
Control Material	Normal QC	High Abnormal QC	HemosIL Cal QC
QC Mean	11.63	39.28	
Analytical Performance Specification	7	15	5.4
APS (Source)	EFLM	EFLM	EFLM
Bias	0	0	0
Precision (SD from QC)	1.55	2.99	1.2
Sigma metric	4.5	5.0	4.5
Patient risk Sigma	4.5	5.0	4.5
Patient Risk Factor	3	5	5
Maximum run size	1000	200	200
	Calculated Results		
Candidate SQC Procedures	Run size		
1:3s/2:2s/R:4s/4:1s, N=4 (Pfr = 0.03)	1000	200	200
1:3s, N=4 (Pfr = 0.01)	776	200	200
1:3s/2of3:2s/R:4s/3:1s N=3 (Pfr=0.02)	1000	200	200
1:3s N=3 (Pfr=0.01)	458	200	200
1:3s/2:2s/R:4s, N=2 (Pfr=0.01)	411	200	200
1:3s, N=2 (Pfr=0.00)	203	200	200
1:3.5s, N=2 (Pfr=0.00)	66	200	106
1:2s, N=1 (Pfr=0.05)	478	200	200
1:2.5s, N=1 (Pfr=0.01)	171	200	200
1:3s, N=1 (Pfr=0.00)	62	200	101

QC Design walkthrough – D-Dimer

Analyst	S MacDonald	
Date	06/12/2024	
Analyser	ACL-TOP 750 CTS	
Test	D-Dimer	
Units	ng/mL DDU	
Critical decision level	230	
Control Material	DD Low	DD High
QC Mean	268.2	565
Analytical Performance Specification	20	20
APS (Source)	Clinical Outcome (Model 1b)	Clinical Outcome (Model 1b)
Bias	0	0
Precision (SD from QC)	5.42	4.21
Sigma metric	3.7	4.8
Patient risk Sigma	3.7	4.8
Patient Risk Factor	1	3
Maximum run size	100	100
	Calculated Results	
Candidate SQC Procedures	Run size	
1:3s/2:2s/R:4s/4:1s, N=4 (Pfr = 0.03)	75	100
1:3s, N=4 (Pfr = 0.01)	26	100
1:3s/2of3:2s/R:4s/3:1s N=3 (Pfr=0.02)	56	100
1:3s N=3 (Pfr=0.01)	18	100
1:3s/2:2s/R:4s, N=2 (Pfr=0.01)	17	100
1:3s, N=2 (Pfr=0.00)	11	100
1:3.5s, N=2 (Pfr=0.00)	3	100
1:2s, N=1 (Pfr=0.05)	32	100
1:2.5s, N=1 (Pfr=0.01)	11	100
1:3s, N=1 (Pfr=0.00)	4	98