



DISH

DEHISCENCE | INFECTION
SEROMA | HEMATOMA

Redefining Surgical Incision Outcomes: A Modified Delphi Study to Establish a Novel Universal Classification System

Philip L Russo,¹⁻³ **Marja A. Boermeester**,^{4,5} **Giles Bond-Smith**,⁶ **Antonia F. Chen**,⁷ **David Leaper**,^{8,9}

¹Monash Nursing and Midwifery, Monash University, Australia

²Cabrini Research, Cabrini Health, Australia

³Avondale University, Australia

⁴Department of Surgery, Amsterdam UMC, University of Amsterdam, Amsterdam, The Netherlands

⁵Amsterdam Gastroenterology Endocrinology Metabolism, Amsterdam UMC, University of Amsterdam, Amsterdam, The Netherlands

⁶Oxford University Hospitals NHS Foundation Trust, Oxford, United Kingdom

⁷Department of Orthopedic Surgery, University of Texas Southwestern, Dallas, Texas, USA

⁸University of Newcastle, Newcastle, UK

⁹University of Huddersfield, Huddersfield, UK

Disclosures and Acknowledgements

Funding:

Johnson & Johnson

Acknowledgements:

Costello Medical facilitated the modified Delphi Study and provided writing support for this presentation.

Disclosures:

PLR: Has previously undertaken private work for Johnson & Johnson, Essity, and 3M

MAB: Received institutional grants from Johnson & Johnson/Ethicon and 3M; and being a speaker and/or instructor for Johnson & Johnson/Ethicon, 3M, Becton Dickinson, Gore, Smith & Nephew, TelaBio, Angiodynamics, GDM, Medtronic, Molnlycke, Novus Scientific and Suturion

GBS: Reimbursement by Johnson & Johnson and Becton Dickinson for educational activity

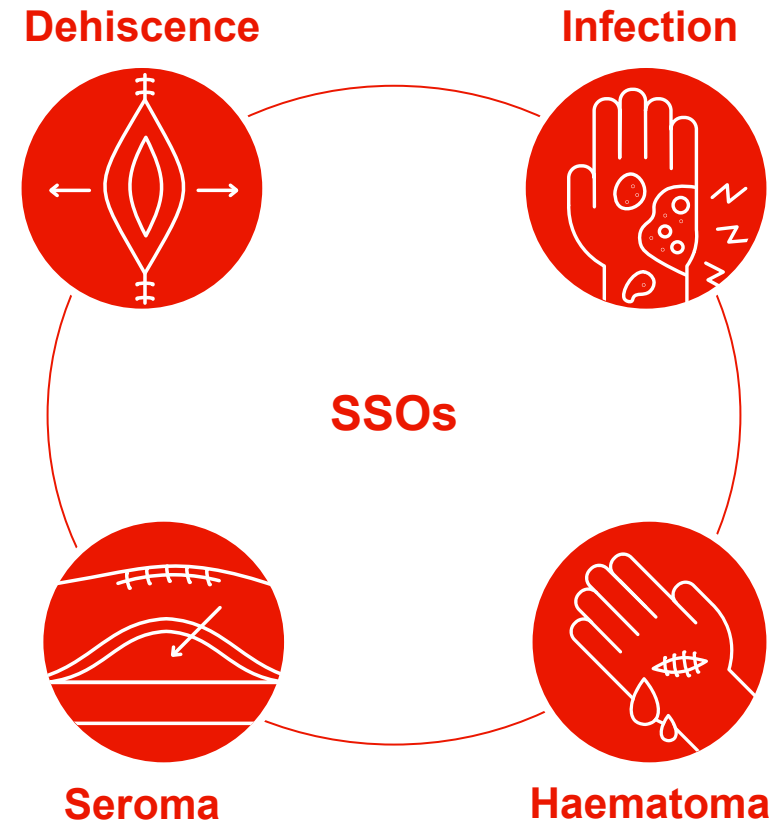
AFC: Consultant for Avanos, BICMD, Convatec, Heraeus, IrriMax, Johnson & Johnson/Ethicon, Osteal Therapeutics, Peptilogics, Regeneron, Smith & Nephew, Solenic, Stryker, TrialSpark; has stock options from Hyalex, Osteal Therapeutics, Solenic, Sonoran, IlluminOss; receives royalties from Stryker, Taylor & Francis Group, Journal of Bone and Joint Surgery, UpToDate; and receives research support from Sectra and Regeneron

DL: Honoraria from Johnson & Johnson

Burden and Unmet Need

Surgical site outcomes (SSOs) **dehiscence**, **infection**, **seroma**, and **haematoma** are costly to hospitals and patients¹⁻³

- Existing definitions of dehiscence, infection, seroma and haematoma are variable⁴⁻⁹
- This is a barrier to:
 - Correct identification and surveillance of SSOs
 - Successful introduction of guidelines and care bundles
 - Development of a strong evidence base
- A common language is needed so that everyone can discuss these outcomes easily and consistently



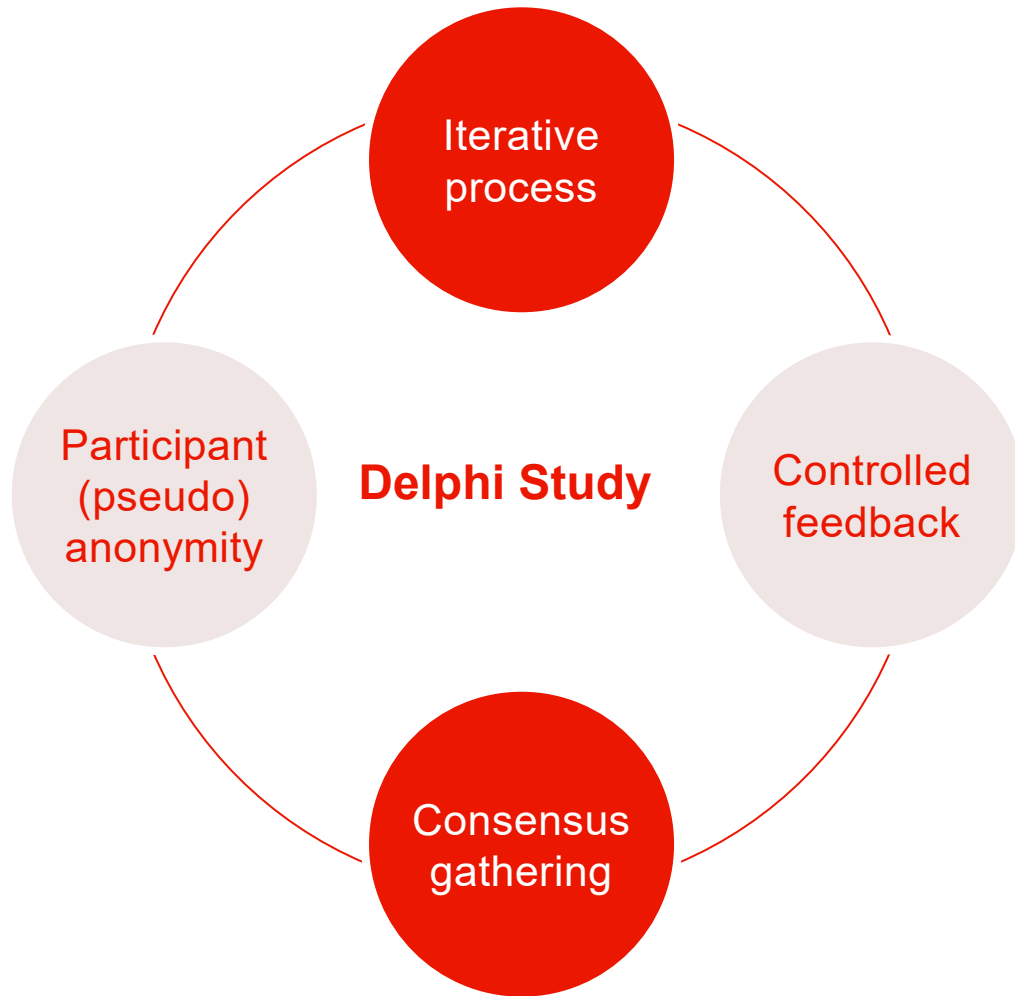
References: 1. Badia, JM et al. J Hosp Infect 2017;96:1-15. 2. Jenks, PJ et al. J Hosp Infect 2014;86:24-33. 3. Gabriel, A et al. Plast Reconstr Surg 2019;143:7S-10S. 4. US Department of Health and Human Services. CTCAE v5.0. 2017. Available from: https://ctep.cancer.gov/protocoldevelopment/electronic_applications/docs/ctcae_v5_quick_reference_5x7.pdf [Accessed August 2025]. 5. Rosen RD, et al. Wound Dehiscence. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 May 1. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551712/> [Accessed August 2025]. 6. Damjanov I. Hemodynamic disorders. In: Damjanov I, ed. Pathology Secrets. 3rd ed. Philadelphia: Mosby; 2009:38-57. 7. De Rooij L, et al. Eur J Surg Oncol. 2021;47:757-63. 8. Dieter S. Treating a Post-Surgical Seroma or Hematoma. 2021. Available from: <https://sanamedtech.com/blog/treating-post-surgical-seroma-hematoma/> [Accessed August 2025]. 9. Tollefson MK. Complications of the incision and patient positioning. In: Taneja SS, ed. Complications of Urologic Surgery. 4th ed. Philadelphia: W.B. Saunders; 2010:225-36.

Study Objective

To establish a universal classification system comprising *dehiscence, infection, seroma* and *haematoma* graded by severity, to enable standardisation of SSO reporting

Modified Delphi Method

A modified Delphi study was conducted to develop the proposed endpoint



Participants:

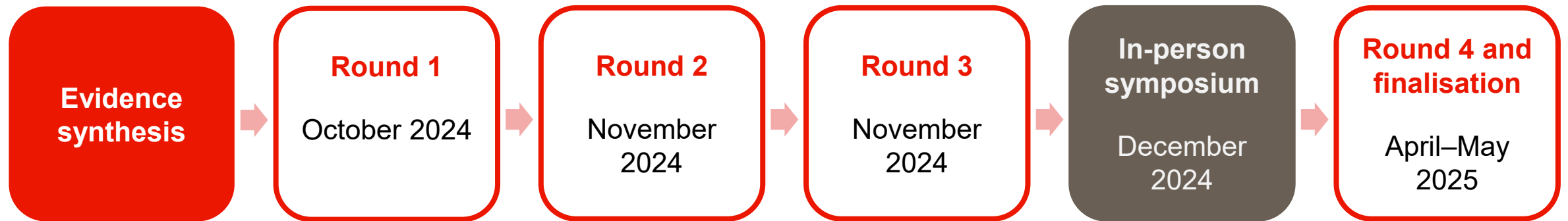
- Five-member Steering Committee
- 32 pan-specialty panellists from across the world (Expert Panel)

Statements:

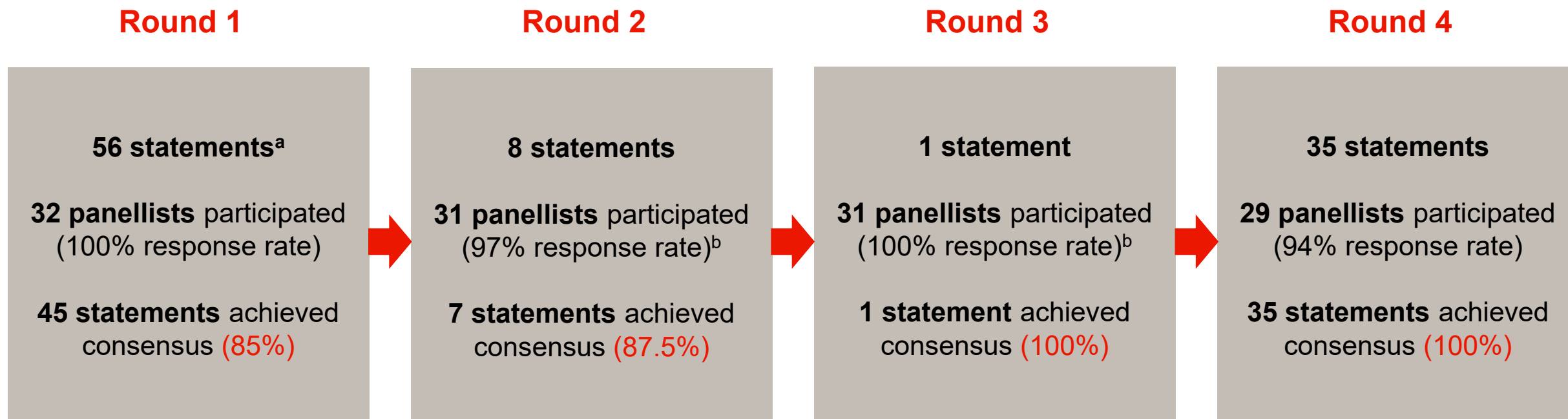
- Likert-based statements sought $\geq 75\%$ agreement as consensus
- Statements without consensus were revised for subsequent rounds, guided by free-text responses

Overview of the Process

This modified Delphi study was conducted in accordance with the ACcurate COnsensus Reporting Document (ACCORD) guidelines¹



Modified Delphi Study Results Overview: Rounds 1–4



Key areas of non-consensus:

- Definition and grading of infection
- Inclusion of antibiotics as a clinical intervention

Symposium post-Round 3

Discussion and critique at symposium shaped statements for Round 4

Modified Delphi Study Results Overview: Rounds 1–4

Round 1

Round 2

Round 4

The clinical presentation of a Grade 1 dehiscence is "partial separation of the incision edges with no fluid discharge"

45 statements achieved
co

participated
(97% response rate)^b

31 panellists participated
(100% response rate)

29 panellists

35 statements

The clinical presentation of a Grade 4 infection is "severe infection related to the incision with clear systemic signs of sepsis e.g. fever, raised inflammatory markers"

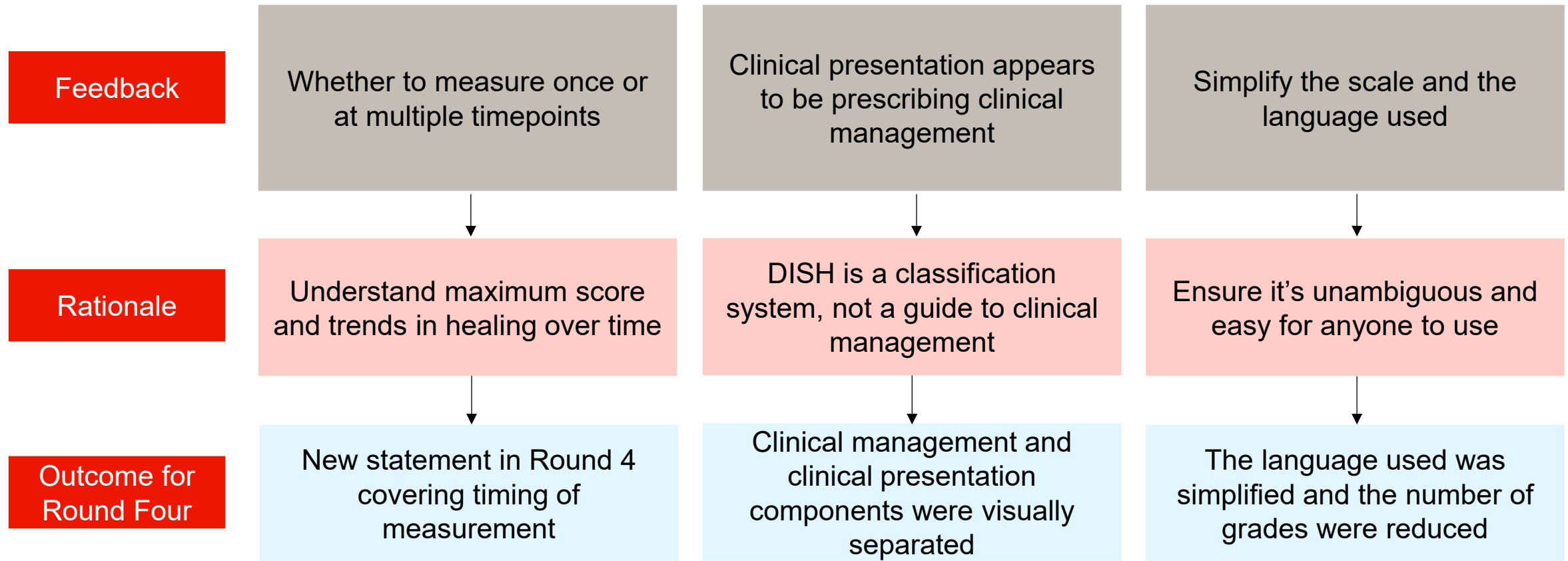
Symposium post-Round 3

Discussion and critique at symposium shaped statements for Round 4

- Inclusion of antibiotics as a clinical intervention

Outcomes from the Symposium

Feedback from the symposium was used to inform Round Four of the modified Delphi study



'DISH Classification System': Simplified Clinical Management Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
0	None	None	None	None
1	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring
2	Local treatment	Healthcare professional monitoring	Healthcare professional monitoring	Healthcare professional monitoring
3	Surgery without reconstruction	Surgery with local anaesthesia	Local treatment	Local treatment
4	Surgery with reconstruction	Surgery with general, spinal or regional anaesthesia	Surgery with general, spinal or regional anaesthesia	Surgery or radiological intervention

Please scan the QR code to access the full DISH scale:



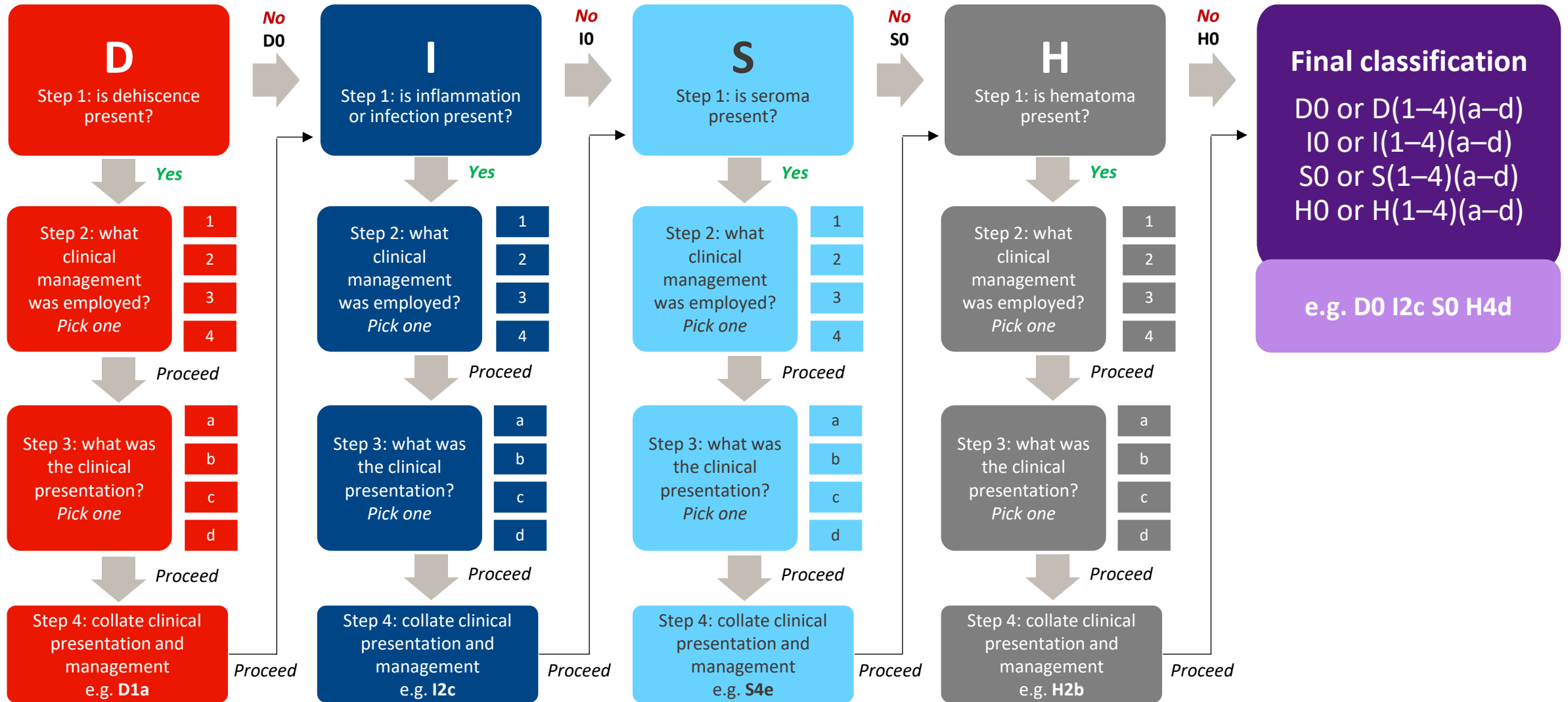
'DISH Classification System': Simplified Clinical Presentation Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
a	Partial separation of the incision edges	≥1 sign of inflammation	Presence of localised fluid collection with minimal discomfort/pressure	Bruising related to the incision, without causing substantial symptoms
b	Substantial separation of the incision edges	Two or more of the following clinical signs: redness, swelling, heat, pain, non-serous exudate; plus one or more of the following: elevated C-reactive protein, increased serum white blood cell count, temperature over 38°C (100.4°F), positive wound or blood culture, gas in tissues	Large fluid collection causing moderate discomfort/pressure	Enlarging haematoma causing swelling and pain
c	Extensive separation of the incision edges	Severe infection with systemic signs of sepsis or mono-organ failure	Large, complex fluid collection causing significant symptoms	Significant haematoma compromising nearby organs or structures
d	Dehiscence of all surgical tissue layers	Septic shock; Sepsis related multi-organ failure	Large, complex fluid collection causing life-threatening symptoms or a chronic walled-off collection	Significant haematoma, with active bleeding

Please scan the QR code to access the full DISH scale:



'DISH Classification System': Using DISH in Practice



DISH in Practice



'DISH Classification System': Simplified Clinical Management Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
0	None	None	None	None
1	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring
2	Local treatment	Healthcare professional monitoring	Healthcare professional monitoring	Healthcare professional monitoring
3	Surgery without reconstruction	Surgery with local anaesthesia	Local treatment	Local treatment
4	Surgery with reconstruction	Surgery with general, spinal or regional anaesthesia	Surgery with general, spinal or regional anaesthesia	Surgery or radiological intervention

Please scan the QR code to access the full DISH scale:



'DISH Classification System': Simplified Clinical Management Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
0	None	None	None	None
1	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring	Patient self-monitoring
2	Local treatment	Healthcare professional monitoring	Healthcare professional monitoring	Healthcare professional monitoring
3	Surgery without reconstruction	Surgery with local anaesthesia	Local treatment	Local treatment
4	Surgery with reconstruction	Surgery with general, spinal or regional anaesthesia	Surgery with general, spinal or regional anaesthesia	Surgery or radiological intervention

Please scan the QR code to access the full DISH scale:



'DISH Classification System': Simplified Clinical Presentation Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
a	Partial separation of the incision edges	≥1 sign of inflammation	Presence of localised fluid collection with minimal discoloration	Bruising related to the incision, without causing symptoms
b	Substantial separation of the incision edges	≥2 signs of inflammation and ≥1 sign of infection	Large moderate seroma	Haematoma and bruising
c	Extensive separation of the incision edges	Severe infection with systemic signs of sepsis or mono-organ failure	Large seroma causing symptoms	Haematoma nearby bruising
d	Dehiscence of all surgical tissue layers	Septic shock; Sepsis related multi-organ failure	Large seroma causing symptoms off colour	Haematoma, bruising



Please scan the QR code to access the full DISH scale:



'DISH Classification System': Simplified Clinical Presentation Scale

	Dehiscence	Inflammation/Infection	Seroma	Haematoma
a	Partial separation of the incision edges	≥1 sign of inflammation	Presence of localised fluid collection with minimal discoloration	Bruising related to the incision, without causing symptoms
b	Substantial separation of the incision edges	≥2 signs of inflammation and ≥1 sign of infection	Large seroma causing moderate symptoms	Haematoma and bruising
c	Extensive separation of the incision edges	Severe infection with systemic signs of sepsis or mono-organ failure	Large seroma causing moderate symptoms	Haematoma and bruising nearby
d	Dehiscence of all surgical tissue layers	Septic shock; Sepsis related multi-organ failure	Large seroma causing moderate symptoms off colour	Haematoma, bruising



Please scan the QR code to access the full DISH scale:



DISH in Practice



D2b

I2b

S0

H0

Modified Delphi Study: Conclusions

- Consensus was reached on a universal classification system including dehiscence, inflammation/infection, seroma and haematoma, collectively referred to as '**DISH**'
- This proposed system **aims to improve patient outcomes** by facilitating more accurate:
 - Surveillance and audit
 - Reimbursement planning
 - Standardisation of terms used across all surgical specialties
- DISH may also reduce the burden of SSI surveillance on IPC teams

Where next?

- Testing of robustness, validation and multi-specialty application of DISH
- Full manuscript submitted
- Trial and feedback from key stakeholders currently ongoing