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Reducing Low Benefit Care

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Reducing Low Benefit Care

Low benefit care (LBC) – care that is ineffective, harmful or confers marginal benefit at disproportionately high cost – poses risk to patient health and sustainability of healthcare systems, especially in a post-COVID recovery period characterised by constrained budgets. This guidance document from the Statewide General Medicine Clinical Network (SGMCN) aims to assist clinicians working in general medicine services in identifying and minimising low benefit clinical practices. Recommendations relating to specific practices are supported by evidence-based rationales and, where possible, preventive or mitigation strategies. Factors that predispose to low benefit care, programmatic strategies for reducing low benefit care, and methods for evaluating effectiveness of such strategies are also detailed. The SGMCN Steering Committee reviewed the document and provided feedback, with provisional endorsement conferred on 8/9/20. Feedback was then sought from all other statewide clinical networks, and amendments were made in response to comments received up to 9/10/20. The revised document was given final endorsement from the SGMCN steering committee on the 12/10/20. This document will be periodically updated as new evidence becomes available that identifies more examples of LBC.

Disclaimer: The recommendations contained herein are not intended to substitute for, or override, clinical judgement, and that decisions should be made after considering local institutional guidelines or advice from local specialists or governance bodies.

Contents

Background

Low benefit care (LBC) has been defined as care that is ineffective, harmful or confers marginal benefit at disproportionately high cost.[1] It is estimated that 60% of current healthcare is effective, 30% is ineffective (amounting to at least $A34 billion in 2016), and 10% actually causes patient harm.[2] In Australia LBC assumes several forms such as over-diagnosis and over-use of tests, over-prescribing of medications, and over-use of procedures.[3,4,5] Studies have estimated that between 10% and 50% of commonly performed practices in hospital general wards are low benefit.[3,6] Basic questions need to be asked: What health care works, and for whom? Under what circumstances? Is emerging technology actually an improvement?

LBC poses several threats. First it presents a potential health hazard to patients in having potentially detrimental consequences, in either the short or long term. Too often, LBC is perceived as benign - harmless to patients and justified if there is any potential at all for benefit. Evidence suggests both clinicians and patients typically overestimate the benefits of interventions and underestimate their harms.[7,8] These detrimental consequences comprise physical harm (eg. pain, injury, disability), psychological harm (eg. anxiety), treatment burden (eg. inconvenience, lost time, complexity of care), social disruption, financial loss (eg. lost wages) and dissatisfaction with care (including disruption to, and mistrust within, the patient-clinician relationship). These detrimental consequences can arise directly from an episode of LBC or indirectly as a result of downstream interventions (or cascades of care) following an episode of LBC. For example, complications from an unnecessary test or procedure could trigger additional interventions causing additional negative consequences leading to yet more interventions, and so on. Providing care that, even if effective, patients do not want because of personal preferences can also cause harm, at least psychologically. Harm can also result indirectly when, under capacity constraints, LBC for one individual results in delayed delivery of high value care, and resultant preventable harm, to another individual.

> *Among 9330 admissions to 225 Australian hospitals for seven LBC procedures, between 0.2% and 15.0% of patients, depending on the procedure, developed at least one of 16 hospital-acquired complications (HACs), the most common being health care–associated infection (26.3% of all HACs reported).[9] For all seven procedures, median length of stay for patients with a HAC was 2 times or more than that of patients without a complication.*

Second, LBC represents a threat to the appropriate stewardship of limited resources[10] - a threat now magnified by the unprecedented budget deficits imposed on every government in Australia by the

[1] Scott IA, Duckett S. In search of professional consensus around defining and reducing low benefit care. Med J Aust 2015; 203: 179-181.
[2] Braithwaite J, Glasziou P, Westbrook J. The three numbers you need to know about healthcare: the 60-30-10 challenge. BMC Med 2020: 18:102-108.
[3] Scott IA. Audit-based measures of overuse of medical care in Australian hospital practice. Intern Med J 2019; 49: 893-904.
[4] Badgery-Parker T, Pearson S-A, Chalmers K, et al. Low-value care in Australian public hospitals: prevalence and trends over time. BMJ Qual Saf 2019;28(3):205-214.
[5] Chalmers K, Pearson S-A, Badgery-Parker T, et al. Measuring 21 low benefit health care services in an Australian private health insurance population (2010-2014). BMJ Open 2019; 9(3): e024142.
[6] Corral-Gudino L, Rivas-Lamazaresa A, González-Fernández A, et al. Does my patient really need this at admission? Seven opportunities for improving value in patient care during their hospitalization. Eur J Intern Med 2019; 66: 92–9.
[7] Hoffman T, del Mar C. Patients' expectations of the benefits and harms of treatments, screening, and tests: a systematic review. JAMA Intern Med 2015; 175: 274-286.
[8] Hoffman T, del Mar C. Clinicians' expectations of the benefits and harms of treatments, screening, and tests: a systematic review. JAMA Intern Med 2017; 177: 407-419.
[9] Badgery-Parker T, Pearson S-A, Dunn S, Elshaug AG. Measuring hospital-acquired complications associated with low-value care. JAMA Intern Med 2019;179(4):499-505.
[10] Wolfson D, Santa J, Slass L. Engaging physicians and consumers in conversations about treatment overuse and waste: a short history of the Choosing Wisely Campaign. Acad Med 2014;89(7):990-995.

COVID-19 pandemic. Money spent on LBC means there is less available to spend on higher value care, and this resource constraint may lead to irrational rationing of care. This can create tensions in that, while clinicians recognise their professional responsibility to manage healthcare resources wisely, they also believe their primary obligation is to provide care to the individual patient.[11] Relatively few clinicians[12] or patients[13] find cost arguments powerful, except in the case of unaffordable out-of-pocket expenses for patients. For these reasons, efforts to reduce LBC embrace effectiveness and safety as the basic unifying concepts rather than cost.

To date, LBC has been stubbornly difficult to reduce, due to a complex range of barriers.[14] However, during the COVID-19 pandemic, health services have had to pivot out of necessity. As a consequence of the need to restrict non-essential movements of patients to and from hospitals, and minimise interactions between staff and infected patients, the pandemic has caused clinicians and professional societies to closely scrutinise clinical practices that were 'non-essential' or 'discretionary' and could either be withheld altogether or deferred to a later date when the pandemic posed less of a threat.[15,16] Many of these practices included those that, even in the absence of a pandemic, would be classed as LBC, such as upper GI endoscopy for dyspepsia with no alarm features or carotid artery ultrasound in patients with syncope. Moreover, there is ample evidence of the 'risk-treatment paradox' in that many clinical interventions involve healthier patients at lower disease risk than those at higher risk with more to gain.[17] In other words, rather than making patients healthier, these interventions reflect what healthier patients are more likely to receive. The opportunity presented by the pandemic of identifying and doing away with LBC should not be squandered.

General medicine services provide care for at least a third of all acute adult medical admissions to Queensland public hospitals. Many of these admissions involve older patients with multiple co-morbidities and varying degrees of frailty who are more vulnerable to iatrogenic harm and may benefit from less intrusive, less invasive management. General medicine services often encounter patients to whom low benefit practices have been provided or suggested by other providers. In some instances, general medical teams have to mediate between the patient's best interests and care recommendations made by a variety of other disciplines which may be potentially inappropriate. In that sense, this document is intended for wide distribution to all clinicians, not just those who work in general medicine. Equally, the document should not be viewed as implying that low benefit practices mentioned below are ubiquitous to, and represent a failing of, care provided by general physicians.

In minimising LBC, several steps have to be undertaken:

- Identify commonly used practices for which there is well established evidence to show that, in most circumstances, they constitute LBC.
- Identify and implement de-implementation strategies that, on the basis of evidence, can reduce the frequency of such practices without compromising safety and quality of patient care.

[11] Tilburt JC,Wynia MK, Sheeler RD, et al. Views of US physicians about controlling health care costs. JAMA 2013;310(4):380-388.
[12] Chimonas SC, Diaz-MacInnis KL, Lipitz-Snyderman AN, et al. Why not? Persuading clinicians to reduce overuse. Mayo Clin Proc Innov Qual Outcomes 2020;4(3):266-275.
[13] Schleifer D, Rothman DJ. 'The ultimate decision is yours': exploring patients' attitudes about the overuse of medical interventions. PLoS One 2012;7(12):e52552.
[14] Mafi JN, Parchman M. Low benefit care: an intractable global problem with no quick fix. BMJ Qual Saf 2018; 27(6): 333-336.
[15] Lou E, Beg S, Bergsland E. Modifying practices in GI oncology in the face of COVID-19: Recommendations from expert oncologists on minimising patient risk. JCO Oncol Pract 2-20; 16(6): 383-388.
[16] Cho HJ, Feldman LS, Keller S, et al. Choosing Wisely in the COVID-19 era: Preventing harm to healthcare workers. J Hosp Med 2020; 15(6): 360-362.
[17] Scott IA, Derhy P, O'Connor D, et al. Discordance between level of risk and treatment intensity in patients with acute coronary syndromes. Med J Aust 2007; 187: 153-159.

- Evaluate the effectiveness of such strategies by measuring the change in frequency of use of LBC practices over time.

- Expand the spectrum of what has been identified as LBC on the basis of evolving evidence, and revise and adapt de-implementation strategies as required on the basis of evidence of effectiveness.

Commonly used LBC practices

In identifying LBC practices relevant to patients who receive care from general medicine services, the following methodology was used:

- Several reference sources which provide guidance for reducing LBC were consulted:
    - Choosing Wisely Australia (CWA) website which lists commonly used practices that 30 national medical colleges and societies consider to be overused. These include recommendations from the Royal Australasian College of Physicians (RACP) EVOLVE program.
    - Websites of the US Society of General Internal Medicine, US Society of Hospital Medicine and the Canadian Society of Internal Medicine which list 'do not do routinely' recommendations.
    - JAMA Internal Medicine 'Less is More - Teachable Moments' website which contains clinical vignettes of LBC and expert commentaries detailing alternative approaches.[18]
    - Journal of General Internal Medicine 'Things We Do For No Good Reason' website where the pros and cons of specific practices in particular scenarios are discussed in determining whether they constitute LBC.
    - BMJ 'Too Much Medicine' series of articles.[19]
    - UK National Institute of Clinical Excellence 'Do Not Do' lists of LBC practices.
    - UK Academy of Medical Royal Colleges document 'Evidence-based Interventions. Engagement Document.' July 2020 which lists several procedures on which there is consensus of inappropriateness.

- As the intention was not to provide an exhaustive list of recommendations, selection for inclusion was based on whether the low benefit practice in question is:
    - commonly encountered among patients who receive care or consultations from general medicine clinicians.
    - seen as having a reasonable level of evidence of ineffectiveness or harm.
    - able to be influenced by the opinions and advocacy of general medicine clinicians.
    - able to be measured over time in gauging the effects of strategies for reducing its occurrence.
    - not a topic or practice that lies within the exclusive remit of a particular specialty or discipline.

The following sections deal with LBC practices relating to investigations, medications, blood products, procedures, end of life care and perioperative medicine. For each practice, the recommendation is followed by a brief rationale underpinning the recommendation, and, where possible, suggested strategy(ies) for reducing the practice.

[18] Grady D, Redberg RF. Less is More: how less health care can result in better health. Arch Intern Med 2010;170(9):749–50.
[19] Moynihan R, Heneghan C, Godlee F. Too much medicine: from evidence to action. BMJ 2013;347:f7141.

Overuse of investigations

Full blood counts, biochemical profiles, erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) should not be repeatedly requested if patients are clinically stable on the basis of regular monitoring of vital signs and responding to appropriate therapy.

Investigations should only be performed where their results will alter management or are required to monitor clinically unstable patients or biomarkers. At least 20% of routinely ordered pathology is unnecessary.[20] The decision to cease antibiotic treatment or switch from intravenous (IV) to oral antibiotics should be guided by the results of microbiological cultures indicating bacterial species and antimicrobial sensitivities, and evidence of defervescence and improved clinical status rather than by changes in the levels of white cell count, ESR or CRP.[21]

Strategy: Combining education programs for junior doctors with decision aids (eg. worn as lanyards), supervision and role modelling by registrars and consultants, and regular unit-level feedback on pathology ordering can reduce unnecessary over-ordering by 50%.[22,23,24]

Avoid blood cultures in patients who are not systemically septic, have a clear source of infection and in whom a direct specimen for culture (e.g. urine, wound swab, sputum, cerebrospinal fluid, or joint aspirate) is possible.

Blood cultures in such situations do not add more information that would aid clinical management. Less than 10% of blood cultures return 'positive' results,[25] and the rate of false positive blood cultures is approximately 50%,[26] leading to unnecessary antimicrobial therapy, longer hospital stays and increased costs. More direct specimen tests have a markedly higher diagnostic yield.[27,28] Fever and leukocytosis frequently provoke blood culturing but are actually poor predictors of bacteraemia in hospitalized patients and should not prompt cultures in isolation.[18] Rigors and a leftward shift in neutrophil count are more predictive. A lower threshold for taking blood cultures may be appropriate in immunosuppressed or older patients at risk of 'cold sepsis' who may not demonstrate a febrile response. The rush to collect culture samples at fever onset can also result in sloppily collected samples which are more likely to be contaminated. Blood cultures are equally likely to have positive results in a bacteraemic patient 24 hours before, at the time of, and after the highest fever.[29]

Strategy: Validated clinical decision tools, such as the Shapiro criteria,[30] have high negative predictive values for bacteraemia and can guide decisions to take blood cultures (**Appendix 1).** Systematic skin preparation, disinfection of the tops of culture bottles, and use of a dedicated phlebotomy team are methods for reducing contaminated blood cultures.[31] Discarding the first

[20] Zhi M, Ding EL, Theisen-Toupal J, et al. The landscape of inappropriate laboratory testing: a 15-year meta-analysis. PLoS One 2013; 8: e78962.
[21] Bruns A, Oosterheert J, Hak E, et al. Usefulness of consecutive C-reactive protein measurements in follow-up of severe community-acquired pneumonia. Eur Respir J 2008; 32(3): 726-32.
[22] Faisal A, Andres K, Rind JAK,et al. Reducing the number of unnecessary routine laboratory tests through education of internal medicine residents. Postgrad Med J 2018; 94(1118):716-719.
[23] Thakkar RN, Kim D, Knight AM, et al. Impact of an educational intervention on the frequency of daily blood test orders for hospitalized patients. Am J Clin Pathol 2015;143(3):393-7.
[24] Bindraban RS, van Beneden M, Kramer MMS, et al. Association of a multifaceted intervention with ordering of unnecessary laboratory tests among caregivers in internal medicine departments. JAMA Netw Open 2019; 2(7): e197577.
[25] Coburn B, Morris AM, Tomlinson G, Detsky AS. Does this adult patient with suspected bacteremia require blood cultures? JAMA 2012;308(5):502-511.
[26] Alahmadi YM, AldeyabMA, McElnay JC, et al. Clinical and economic impact of contaminated blood cultures within the hospital setting. J Hosp Infect 2011;77(3):233-236.
[27] Kennedy M, Bates DW, Wright SB, et al. Do emergency department blood cultures change practice in patients with pneumonia? Ann Emerg Med 2005; 46(5):393-400.
[28] Mountain D, Bailey PM, O'Brien D, Jelinek GA. Blood cultures ordered in the adult emergency department are rarely useful. Eur J Emerg Med 2006; 13(2): 76-9.
[29] Riedel S, Bourbeau P, Swartz B, et al. Timing of specimen collection for blood cultures from febrile patients with bacteremia. J Clin Microbiol 2008;46 (4):1381-1385.
[30] Shapiro NI, Wolfe RE, Wright SB, et al. Who needs a blood culture? a prospectively derived and validated prediction rule. J Emerg Med 2008;35(3):255-264.
[31] Hall KK, Lyman JA. Updated review of blood culture contamination. Clin Microbiol Rev 2006: 19:788–802.

millilitre of the venepuncture sample (initial specimen diversion technique [ISDT] has also been shown to significantly reduce contamination rates, presumably by removing the initially aspirated skin plug.[32]

Troponin (Tn) assays should be reserved for patients presenting to the emergency department in whom a clinical diagnosis of acute coronary syndrome (ACS) is suspected.

Where Tn tests are used for indications other than suspected ACS, they are rarely associated with cardiac disease, cause unnecessary downstream investigations and increase length of hospital stay. Nearly 50% of patients admitted to hospital undergo Tn testing of whom a third have no ACS-suggestive symptoms or signs or ECG changes.[33] Patients without chest pain but with elevated Tn levels are more likely to be admitted to hospital than those with non-elevated levels. Most of these patients then receive telemetry monitoring, further investigations (such as stress testing), and cardiology consultation, with some receiving ACS medical therapies.[34] These practices impose harm of unnecessary medications, extraneous procedures, and delays in necessary non-cardiac treatments. The advent of high-sensitivity Tn assays has heightened the problem as these may be elevated in patients with many cardiac and non–cardiac conditions, including those with stable underlying coronary disease.[35]

Strategy: More selective troponin testing and more diligent interpretation of elevated troponin levels within the context of the clinical presentation avoid inappropriate cascades of care. In most situations, troponin should be assessed no more than three times, appropriately spaced over 18–24 hours, noting that there is no clinical utility to further testing or trending elevated troponin to peak or resolution in the absence of a diagnosis of ACS. Ordering algorithms and guidelines, changes to electronic order entry systems, and iterative education, audit, and feedback cycles to clinicians ordering troponin assays can promote optimal interpretation of patient troponin levels and minimize inappropriate downstream testing.[36,37,38]

Holter monitoring, carotid arterial duplex scans, echocardiography, or electroencephalograms (EEGs) should not be requested in patients with first presentation of uncomplicated syncope and no high-risk features.

These investigations have very low diagnostic yield in low risk patients with uncomplicated syncope.[39,40,41,42] In circumstances suggesting higher cardiac risk, Holter monitoring or telemetry is appropriate for detecting arrhythmia (e.g. palpitations preceding syncope, exertional syncope, unheralded syncope, history suggestive of heart failure or ischaemic heart disease). Transient ischaemic attacks suggesting carotid artery stenosis do not present as syncope unaccompanied by focal neurological symptoms or signs. Echocardiography should only be performed if the cardiac exam and chest X-ray suggests valvular disorders (e.g. definite heart murmurs) or features of heart failure. Epileptic seizures

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[32] Patton RG, Schmitt T. Innovation for reducing blood culture contamination: initial specimen diversion technique. J Clin Microbiol 2010; 48:4501–4503.

[33] Makam AN, Nguyen OK. Use of cardiac biomarker testing in the emergency department. JAMA Intern Med 2015;175(1):67-75.

[34] de Lemos JA. Increasingly sensitive assays for cardiac troponins: a review. JAMA 2013;309(21): 2262-2269.

[35] Brush JE Jr, Kaul S, Krumholz HM. Troponin testing for clinicians. J Am Coll Cardiol 2016;68(21): 2365-2375.

[36] Meng QH, Zhu S, Booth C, et al. Impact of the cardiac troponin testing algorithm on excessive and inappropriate troponin test requests. Am J Clin Pathol 2006;126:195-199.

[37] Larochelle MR, Knight AM, Pantle H, et al. Reducing excess cardiac biomarker testing at an academic medical center. J Gen Intern Med 2014; 29(11):1468–74.

[38] Scorgie R, Nicholls GM, Jones P. Association between an educational intervention and a reduction in inappropriate troponin testing in patients presenting to an adult emergency department. Intern Med J 2014; 44(11):1100-8.

[39] Johnson P, Ammar H, Zohdy W, et al. Yield of diagnostic tests and its impact on cost in adult patients with syncope presenting to a community hospital. South Med J 2014; 107(11): 707–14.

[40] Mendu M, McAvay G, Lampertet R, et al. Yield of diagnostic tests in evaluating syncopal episodes in older patients. Arch Intern Med 2009; 169(14): 1299–305.

[41] Kadian-Dodov D, Papolos A, Olin JW. Diagnostic utility of carotid artery duplex ultrasonography in the evaluation of syncope: a good test ordered for the wrong reason. Eur Heart J Cardiovasc Imaging 2015;16(6):621-5.

[42] Anderson KL, Limkakeng A, Damuth E, Chandra A. Cardiac evaluation for structural abnormalities may not be required in patients presenting with syncope and a normal ECG result in an observation unit setting. Ann Emerg Med 2012;60(4):478-484.e1.

rarely manifest as syncope unaccompanied by post-ictal confusion. Most syncopal episodes are vasovagal or secondary to postural hypotension. Unnecessary investigations can lead to incidental findings of unclear clinical significance ("incidentalomas") which can trigger clinical cascades of further testing and harmful intervention.[43]

Strategy: Careful history and physical examination, coupled with measurement of lying and standing blood pressure, are the most important diagnostic tools. Several prediction rules exist for stratifying risk of adverse outcomes in patients with syncope (such as the San Francisco Syncope Rule [SFSR][44] and the more recent Canadian Syncope Risk score [CSRS],[45] which have both undergone validation studies). Past research suggests their accuracy varies according to different settings[46] and may be no better than clinical judgment.[47] The CSRS **(Appendix 2)** may be used during initial evaluation of syncope at the discretion of the treating physician (the score includes points for a provisional clinical diagnosis of vasovagal or cardiac syncope) and should include all available ECGs, as well as results of cardiac monitoring in the emergency department. In patients without an evident cause of syncope, a score of less than -1 is associated with a probability of a non-arrhythmic serious outcome of less than 1%, and 0% for death or ventricular arrhythmia. Patients with these scores can be safely discharged.

Hospitalisation for further evaluation is often not required for patients with low risk chest pain.

In an era of accelerated diagnostic protocols that integrate clinical features, ECG findings and troponin (Tn) levels in stratifying the risk of coronary pain in patients presenting with non-specific chest pain, studies have shown that up to a third of patients currently admitted for further evaluation who have normal ECG and non-elevated Tn levels on presentation to the emergency department (ED) could be evaluated as an outpatient or may not require any further investigation at all.[48]

Strategy: A complete history and physical examination, along with ECG and cardiac biomarker testing, are required for all patients presenting with chest pain. Validated clinical risk prediction models should be used to determine the likelihood of a cardiac event.[49] The Queensland Suspected ACS pathway (https://clinicalexcellence.qld.gov.au/sites/default/files/docs/clinical-pathways/cardiac-clinical-pathways/suspected-acute-coronary-pathway.pdf) stipulates that patients are at low risk if fulfilling all the following criteria: age <40 years or <18 years for indigenous populations; atypical symptoms; absence of coronary artery disease; no further symptoms; no haemodynamic instability; normal cardiac troponin; normal ECG. In other jurisdictions, cardiac risk scores are used where a low risk HEART score of 0–3 and TIMI scores of 0-1 predicts a 30 day risk of major adverse cardiac events less than 1% (**Appendix 3).**[50] These scores, combined with normal highly sensitive troponin assays at 0 and 2 hours, have a

[43] Canzoniero JV, Afshar E, Hedian H, et al. Unnecessary hospitalization and related harm for patients with low-risk syncope. JAMA Internal Medicine 2015; 175(6):1065-7.
[44] Quinn J, McDermott D, Stiell I, et al. Prospective validation of the San Francisco Syncope Rule to predict patients with serious outcomes. Ann Emerg Med 2006;47(5):448-454.
[45] Thiruganasambandamoorthy V, Sivilotti MLA, Le Sage N, et al. Multicenter emergency department validation of the Canadian Syncope Risk Score. JAMA Intern Med 2020;180(5):737-744.
[46] Serrano LA, Hess EP, Bellolio MF, et al. Accuracy and quality of clinical decision rules for syncope in the emergency department: A systematic review and meta-analysis. Ann Emerg Med 2010; 56(4): 362–373.
[47] Costantino G, Casazza G, Reed M, et al. Syncope risk stratification tools vs clinical judgment: an individual patient data meta-analysis. Am J Med 2014;127(11):1126.e13-1126.e25.
[48] Perera M, Aggarwal L, Scott IA, Logan B. Received care compared to ADP-guided care of patients admitted to hospital w ith chest pain of possible cardiac origin. Int J Gen Med 2018:11 345–351.
[49] Wamala H, Aggarwal L, Bernard A, Scott IA. Comparison of nine coronary risk scores in evaluating patients presenting to hospital with undifferentiated chest pain. Int J Gen Med 2018:11 473–481.
[50] Fanaroff AC, Rymer JA, Goldstein SA, et al. Does this patient with chest pain have acute coronary syndrome? The Rational Clinical Examination Systematic Review. JAMA 2015;314(18):1955-1965.

negative predictive value for further events of >99%.[51]
These various tools allow clinicians to consider early discharge from ED and outpatient cardiac stress testing, if thought warranted, thereby reducing costs and harm associated with unnecessary hospitalization.[52] Whether outpatient cardiac stress testing is necessary in these low risk patients is also debatable given studies suggesting 500 and 300 patients would need to be tested to prevent one death or myocardial infarction respectively within 30 days of discharge.[53,54] Further refinement of risk stratification processes may allow better targeting of post-discharge stress testing to higher risk individuals.

Do not order continuous telemetry monitoring in acute medical units (outside of the CCU, ICU) without using a protocol that prompts discontinuation when appropriate.

Telemetry is designed to aid in the management of active cardiac conditions but instead is frequently used for stable arrhythmias (eg atrial fibrillation with ventricular rates <110bpm) or closer monitoring of noncardiac conditions for which it has limited utility.[55] Telemetry monitoring is resource intensive, requires nurse training, and consumes nursing time in changing batteries and leads, addressing alarms, and notifying clinicians, all of which may predispose to alarm fatigue and distraction from other aspects of patient care.[56] Overuse of telemetry monitoring rarely detects clinically significant events,[57] causes alert fatigue,[58] and incurs unnecessary healthcare cost.[59] Less than 1 in 10 patients on telemetry undergo change in management as a result of being monitored.[60] Patients presenting with chest pain and who are low risk (hemodynamically stable, negative biomarkers, no ECG changes) do not require telemetry.[61] As many hospitals have a limited number of telemetry beds, inappropriate use causes patients who truly need telemetry to be monitored in the ED which reduces throughput and leads to potentially worse patient outcomes.

Strategy: Clinicians should be required to document indications for telemetry, in accordance with local or published protocols,[62] to regularly review (at least every 12 hours) the ongoing need for telemetry, and if necessary implement hard-stops which mandate cessation if accepted indications for telemetry do not, or no longer, exist (**Appendix 4**).[63]

Thrombophilia testing is not indicated in adult patients unless the first episode of venous thromboembolism (VTE) occurs in the absence of a major transient risk factors (surgery, trauma, immobility) or involves an unusual site (eg upper limb). Extensive investigation for underlying cancer in patients with unprovoked VTE is not warranted.

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[51] Greenslade JH, Carlton EW, Van Hise C, et al. Diagnostic accuracy of a new high-sensitivity troponin I assay and five accelerated diagnostic pathways for ruling out acute myocardial infarction and acute coronary syndrome. Ann Emerg Med 2018; 71: 439-451.
[52] Foy AJ, Liu G, Davidson WR, et al. Comparative effectiveness of diagnostic testing strategies in emergency department patients with chest pain: an analysis of downstream testing, interventions, and outcomes. JAMA Intern Med 2015; 175: 428-436.
[53] Kawatkar AA, Sharp AL, Baecker AS, et al. Early noninvasive cardiac testing after emergency department evaluation for suspected acute coronary syndrome. JAMA Intern Med 2020 doi:10.1001/jamainternmed.2020.4325 Published online October 5, 2020.
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[56] Dressler R, Dryer MM, Coletti C, et al. Altering overuse of cardiac telemetry in non–intensive care unit settings by hardwiring the use of American Heart Association guidelines. JAMA Intern Med 2014;174(11):1852-1854.
[57] Najafi N, Auerbach A. Use and outcomes of telemetry monitoring on a medicine service. Arch Intern Med 2012;172:1349–50.
[58] Feder S, Funk M. Over-monitoring and alarm fatigue: for whom do the bells Toll? Heart Lung 2013;42:395–6.
[59] Dressler R, Dryer MM, Coletti C, et al. Altering overuse of cardiac telemetry in non-intensive care unit settings by hardwiring the use of American Heart Association guidelines. JAMA Intern Med 2014;174:1852–4.
[60] Estrada CA, Rosman HS, Prasad NK, et al. Role of telemetry monitoring in the non-intensive care unit. Am J Cardiol 1995;76:960–965
[61] Dhillon SK, Rachko M, Hanon S, et al. Telemetry monitoring guidelines for efficient and safe delivery of cardiac rhythm monitoring to noncritical hospital inpatients. Crit Pathw Cardiol 2009;8:125–126.
[62] Sandau KE, Funk M, Auerbach A, et al. Update to practice standards for electrocardiographic monitoring in hospital settings: a scientific statement from the American Heart Association. Circulation 2017;136:e273–344.
[63] Stoltzfus KB, Bhakta M, Shankweiler C, et al. Appropriate utilisation of cardiac telemetry monitoring: a quality improvement project. BMJ Open Qual 2019; 8(2): e000560.

Risk of VTE recurrence is best predicted by whether the initial VTE episode was provoked or unprovoked, rather than results of inherited thrombophilia testing.[64] Such testing is costly and can result in harm to patients if the duration of anticoagulation is inappropriately prolonged or if patients are incorrectly labelled as being thrombophilic.[65,66] Thrombophilia testing does not change the management of provoked VTE, but may be appropriate in selected patients with unprovoked VTE, including those younger than 45years, those with a family history of VTE at young age, VTE at unusual sites, recurrent VTE, arterial thrombosis, or pregnancy morbidity.[67] Even in these selected populations, inherited thrombophilia testing should not routinely change management of anticoagulation, although it may allow genetic counselling and testing of first-degree relatives. Clotting in unusual vascular beds (portal, hepatic) should also prompt testing for *JAK2* mutation
and paroxysmal nocturnal hemoglobinuria.
Studies have shown no benefit of interventions to detect occult malignant disease beyond routine, age-appropriate cancer screening in patients with VTE.[68] In particular, requests for upper and lower gastrointestinal (GI) endoscopy in the absence of any other indicators of GI malignancy are not warranted.

Anti-nuclear antibody (ANA) testing is not indicated in patients without symptoms and/or signs suggestive of a systemic rheumatic or autoimmune disease.

Anti-double stranded (ds) DNA antibodies should not be requested in ANA negative patients unless there is a high clinical suspicion of systemic lupus erythematosus (SLE).

Such testing runs the risk of false positive results leading to further unnecessary investigations and useless treatments.[69] False-positive ANA results are common, occurring in 3% to 15% of healthy people and 8% to 11% of patients with fibromyalgia.[70] Thus, ANA testing should not be performed in patients with low pre-test probability of an autoimmune disease. Also, with few exceptions, ANA sub-serologies are usually negative if the ANA result is negative. While ANA testing has a very high negative predictive value for excluding connective tissue diseases as a cause for patients' symptoms, it has a low positive predictive value.[71] Testing for anti-dsDNA antibodies should only occur after detecting a positive ANA in patients with symptoms consistent with SLE.[72]

Faecal occult blood testing is unnecessary in patients who require investigation for proven iron deficiency.

The faecal occult blood test (FOBT) was developed for use in the outpatient setting for colorectal cancer screening in asymptomatic patients with average risk of colorectal carcinoma. Among hospitalised patients reporting rectal bleeding or requiring investigation for iron deficiency or alarm gastrointestinal symptoms (eg. new onset change in bowel habit, abdominal pain), it is unlikely to change patient management and may in fact delay investigations while waiting for the results of the test.[73] Inappropriate use of the FOBT in asymptomatic patients may lead to unnecessary additional investigations (e.g. colonoscopy), which also

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[65] Wai KH, Hankey GJ, Eikelboom JW. Should adult patients be routinely tested for heritable thrombophilia after an episode of venous thromboembolism? Med J Aust 2011;195 (3):139-42.
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carries risks and may limit the availability of such investigations for more appropriate indications.[74]

Invasive investigations should be avoided in evaluating older patients presenting with weight loss who have no localising symptoms or signs or risk factors for malignancy.

Unexplained weight loss in older adults is defined as a weight loss of more than 5% of body weight over 6 to 12 months.[75] It represents a complex interaction of decreased caloric intake, increased caloric losses, and/or energy expenditures, resulting in anorexia, sarcopenia, cachexia, and dehydration. Weight loss in older populations is associated with increased risk of fractures, infection, and poor wound healing.[76] Aetiologies can be separated into organic, psychological, and nonmedical categories. Non-malignant organic and psychosocial causes (eg, psychiatric, ageusia due to polypharmacy, and idiopathic) are more prevalent than malignancy, and account for about 25% of cases.[77] Low yield, invasive testing such as gastrointestinal endoscopies and whole body CT scans are not warranted in the absence of suggestive clinical features or risk factors, and do not improve case-finding or prognosis.

Strategy: Clinical investigations should be tailored to the individual patient and guided by a careful history, including a social and dietary history, review of medication lists, assessment for depression and cognitive impairment, and examination findings, with particular focus on cardiorespiratory, gastrointestinal, and oral organs. These, combined with basic laboratory and imaging studies, will detect almost all underlying malignancies, and obviate the need for more invasive investigations.[78]

Computerised tomography pulmonary angiography (CTPA) should not be used as the first-choice investigation in patients with low risk of pulmonary thromboembolism (PTE) by Well's score. Instead request D-dimer and perform imaging only if D-dimer levels are elevated, after adjusting for age.
Duplex compression ultrasound for suspected lower limb deep venous thrombosis (DVT) is unnecessary in ambulatory outpatients with low risk Well's score and negative D-dimer, after adjusting for age.
Echocardiography is not indicated in patients with PTE who are haemodynamically stable.

Up to 50% of patients with suspected PTE may be subject to unwarranted use of CTPA in the absence of pre-test clinical prediction rules coupled with D-dimer assays.[79] The D-dimer test is highly sensitive for DVT and PTE, such that a negative result (adjusted for age) rules out these conditions in patients with low pre-test probability as defined by the Well's score.[80] Correspondingly, D-dimer assay should be the first-choice investigation in patients at low risk according to the Well's score rather than CTPA which incurs risk of radiation exposure, detection of benign incidentalomas that may provoke invasive investigations, and identification of isolated small subsegmental emboli whose natural history is unknown and for which anticoagulation has not been shown to be of any benefit.[81] In patients with PTE who are haemodynamically stable, echocardiography adds no adds no additional prognostic information and does not change management.[82]

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Strategy: A decision algorithm for assessing patients with suspected PTE based on Well's score and D-dimer assay has been endorsed by the SGMCN and Queensland Emergency Department Strategic Advisory Panel (**Appendix 5**). The systematic use of such algorithms has been shown to reduce inappropriate use of CTPA by more than 30%.[83]

Neuroimaging of the brain is not indicated in evaluating delirium in older patients in the absence of focal neurological signs or risk factors for intracranial bleeding

Undergoing CT or MRI imaging of the brain is traumatic for older delirious patients who are required to sit still in a confined space and can pose risks of aspiration and respiratory arrest if they require heavy sedation in order for such imaging to be performed. In the absence of focal neurological signs suggestive of acute structural brain disease or space occupying lesions, or risk factors for intracranial bleeding (history of fall or headstrike, or receiving systemic anticoagulation), the yield of such imaging in revealing brain pathologies that are causing the delirium and/or that will change management is less than 2%.[84,85,86] It may be reasonable to consider neuroimaging for patients with an atypical course of delirium, such as a sudden decline in the level of consciousness, persistence despite addressing identified factors, or high degree of suspicion for embolic or metastatic processes.

Imaging should not be undertaken for diagnosing non-specific acute low back pain in the absence of red flags.

The majority of acute low back pain episodes are benign, self-limited cases that do not warrant the use of imaging (e.g. X-rays, CT or MRI). There is evidence that early imaging for low back pain in the absence of red flags does not facilitate improvements in primary outcomes such as pain and function, even for older patients. Imaging may in fact reveal incidental findings that divert attention and increase the risk of having unnecessary interventions and invasive treatments including unnecessary surgery.[87]

Overuse of medications

Avoid medication-related harm in older patients (>65 years) receiving five or more regularly used medicines by performing a complete medication review and deprescribing where appropriate.

Medication-related adverse events exceed background rates once the number of regularly prescribed medicines exceeds five;[88] with a 4-fold rise among those receiving 8 or more.[89] Adverse drug events account for up to 10% of all hospital admissions in older adults. Polypharmacy is common: nearly 20% of community-dwelling adults >65 years of age are prescribed 10 or more medications, and almost half of recently hospitalised patients have at least one unnecessary medication at discharge.[90] Changes In pharmacokinetics and pharmacodynamics associated with aging put older patients at greater risk for adverse drug events (ADEs). Medicines deserving particular attention are benzodiazepines and other sedative-hypnotics, antidepressants, anti-psychotics, hypoglycaemic agents, antithrombotic agents, anti-

national practices and clinical outcomes. Ann Am Thorac Soc 2018;15(5): 581-588.

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[89] Onder G, Petrovic M, Tangiisuran B, et al. Development and validation of a score to assess risk of adverse drug reactions among in-hospital patients 65 years or older: the GerontoNet ADR risk score. Arch Intern Med 2010;170(13):1142-1148.

[90] Hajjar ER, Hanlon JT, Sloane RJ, et al. Unnecessary drug use in frail older people at hospital discharge. Jam Geriatr Soc 2005;53(9):1518-1523.

hypertensives, anti-anginal agents and nonsteroidal anti-inflammatory drugs (NSAIDs).[91] Trying to achieve aggressive treatment targets, such as BP <130/80[92] or HbA1c <7%,[93] in frail older patients with multiple co-morbidities confers little benefit and a higher risk of harm. The indications for long term use of proton pump inhibitors (PPIs) and statins should be carefully scrutinised, and there is no indication for PPI prophylaxis with short-term systemic corticosteroid use in the absence of concomitant NSAIDs.[94]

Strategy: The CEASE protocol **(Appendix 6)** guides the identification and discontinuation of medicines according to non-valid indications, past toxicity or non-adherence, and risk of harm outweighing benefits within the context of patient's co-morbidities, remaining life span, quality of life, functional impairment and personal preferences.[95]

Benzodiazepines or other sedative-hypnotics should not be prescribed to older adults as first choice for insomnia, agitation or delirium.
Antipsychotics should not be used as agents of first choice to treat behavioural and psychological symptoms of dementia.

There is strong evidence that use of benzodiazepines and antipsychotics is associated with various adverse effects in older people such as falls and fractures.[96,97] These drugs should be prescribed with caution, and their use monitored closely. Patients with dementia may exhibit aggression, resistance to care and other challenging or disruptive behaviours. In such instances, the modest effectiveness of atypical antipsychotics may be offset by the higher risks for adverse events and mortality.[98]

Strategy: In both situations, effective screening, reversing the precipitants of delirium, and providing supportive non-pharmacological interventions are crucial to addressing delirium **(Appendix 7)**. In patients with acute behavioural disturbances superimposed on dementia, haloperidol is the preferred drug in cases where non-pharmacologic measures have failed and patients pose an imminent threat to themselves or others (**Appendix 8**).

Opioids, particularly long-acting opioids, should not be prescribed as first-line or monotherapy for chronic non-cancer pain (CNCP).
Opioid prescriptions for CNCP should not be continued without ongoing demonstration of functional benefit, periodic attempts at dose reduction and screening for long-term harms.

Most trials assessing efficacy of opioids in CNCP have been less than twelve weeks duration and have shown only modest effects. By contrast opioid use in CNCP has been associated with increased distress, poorer self-rated health, inactivity during leisure, unemployment, higher healthcare utilisation and lower quality of life.[99]

Strategy: Opioids should not be used alone or as analgesics of first choice in patients with CNCP.

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If a trial of opioid is undertaken, then a long-acting preparation should be prescribed, in conjunction with non-drug therapies – physical, behavioural and cognitive – that promote functional restoration, reduce distress and potentially lower pain intensity.[100,101] At hospital discharge, a limited supply of opiates should be prescribed and a weaning regimen provided to general practitioners. In longer term users, an opioid 'contract' should describe the purpose of the prescription and would include agreed criteria for functional improvement, risks and side-effects of opioid analgesics, and ground rules regarding their use and cessation. There should be a single prescriber and single dispensing pharmacy to take responsibility for opioid prescriptions. Patients and their carers should be counselled about how they can best manage opioid induced side effects and be given clear instructions on how they, with assistance from their clinicians, can wean themselves off these drugs.

Pregabalin and gabapentin should not be prescribed for pain which does not fulfil the criteria for neuropathic pain

The definition of neuropathic pain is pain described as burning, painful cold, or electric shock-like, combined with neurological signs of a lesion or disease of the somatosensory system. Pregabalin has a restricted PBS authority for 'neuropathic pain'. As with any pharmacotherapy used in pain medicine, the outcome of a trial of pregabalin or of gabapentin should be judged by improvement in everyday physical, emotional and cognitive functioning, including activity, sleep, absence of adverse effects, and improvement in quality of life. Studies indicate that gabapentinoids have no effect in non-neuropathic musculoskeletal pain.[102]

Do not prescribe gastric acid suppressive medications unless patients are at high risk for gastrointestinal complications.

Up to 70% of inpatients receive gastric acid suppressive medications, principally for stress ulcer prophylaxis, for indications which are not evidence-based.[103] Inappropriate prescribing practices have been associated with multiple adverse events, including drug interactions, hospital-acquired infections, and increased costs of care.[104,105] Once these agents are started in hospital, they are frequently continued after discharge. Specific indications include treatment of gastro-esophageal reflux disease, peptic ulcer disease, acute or suspected gastrointestinal bleeding. Prescribing of these agents is also appropriate if a patient has two or more relative indications (sepsis, occult bleeding, use of high dose corticosteroids, ongoing use of non-steroidal anti-inflammatory drugs, renal or liver failure, enteral feeding and use of anticoagulants).[106]

Long term proton pump inhibitor (PPI) medication should not be prescribed to patients with uncomplicated gastro-oesophageal disease (GORD) without attempting to reduce the medication down to the lowest effective dose necessary to control symptoms or ceasing it altogether.

In association studies, long term use of PPIs has been linked to increased risk of fractures, pneumonia, enteric infections, vitamin and mineral deficiencies, and acute interstitial nephritis, particularly among older people who make up the largest proportion of PPI users.[107,108] Some patients may be able to stop PPI use immediately after the initial course of therapy without experiencing recurrent GORD symptoms whereas in

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others, over the longer term, GORD symptoms may improve such that ongoing PPI is no longer necessary. **This recommendation does not apply to patients with moderate to severe reflux oesophagitis, Barrett's oesophagus, large hiatus hernia, and GORD associated with respiratory or ear, nose and throat complications**. It is also important to ensure the correct diagnosis of GORD in patients with persistent symptoms, and to rule out other conditions such as peptic ulcer disease, gastric outlet obstruction, gallbladder disease, and atypical presentations of myocardial ischaemia.

Anticoagulation should not be extended beyond 3 months for a patient with an index venous thromboembolic event (VTE) provoked by a major, transient risk factor (eg. surgery, trauma, immobility) and associated with non-extensive, low volume clot.

Anticoagulation is potentially harmful and costly. Patients with a first VTE provoked by a major, transient risk factor and associated with low volume clot (ie excluding extensive iliofemoral deep venous thrombosis) are at low risk for recurrence once the risk factor has resolved and an adequate regimen of anticoagulation has been completed.[109] Evidence-based and consensus guidelines recommend three months of anticoagulation over shorter or longer periods of anticoagulation in patients with VTE in the setting of a reversible provoking factor.[110]

Regular use of oral non-steroidal anti-inflammatory medicines (NSAIDs) in older people should be avoided.

While NSAIDs are frequently used in the short term to treat moderate acute pain, they are not usually required after the cause of the acute pain has been addressed. Treatment should be re-assessed if the acute pain has not resolved within 2 weeks. Oral NSAIDs have considerable cardiovascular, gastrointestinal and kidney function risks. They should not be recommended in patients over the age of 60 years and those with kidney disease, history of peptic ulcer disease, hypertension or heart failure.[111] Older people should use the lowest possible dose of an oral NSAID, for the shortest duration possible and multiple NSAIDs should not be taken concurrently. The effectiveness of long-term oral NSAID treatment should be routinely assessed against the individual patient's management plan, and where possible, the total dose should be reduced or ceased.

Combination therapy of inhaled corticosteroids with long-acting beta2 agonist should not be prescribed as initial therapy in mild to moderate asthma before a trial of inhaled corticosteroids alone.

The most recent evidence suggests that adding long-acting beta2 agonists (LABA) to inhaled corticosteroids (ICS) does not result in a statistically significant reduction in asthma exacerbations.[112]

Antibiotics should not be prescribed for exacerbations of asthma.

Antibiotics for asthma exacerbation are not indicated unless there is strong evidence of lung infection, such as fever and purulent sputum or radiographic evidence of pneumonia.[113,114] Antibiotic treatment in addition to its lack of efficacy also increases the risk of bacteria resistance for those on long term treatment regimes.

Discontinue intravenous antibiotics to patients with uncomplicated infections who have become afebrile and are tolerant of oral antibiotics and have no high-risk features.

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[109] Boutitie F, Pinede L, Schulman S, et al. Influence of preceding length of anticoagulant treatment and initial presentation of venous thromboembolism on risk of recurrence after stopping treatment: analysis of individual participants' data from seven trials. BMJ 2011;342:d3036.
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Substitute shorter courses of antibiotics for longer courses in clinical scenarios where evidence shows the former to be superior or non-inferior to the latter.

Immunocompetent patients with uncomplicated infections, if tolerating oral medication, can, in most cases, be switched from IV to oral antibiotics once they are afebrile, which often occurs by day three of admission. Exceptions are patients with life threatening or deep-seated infections (such as endocarditis, osteomyelitis or meningitis), and high risk patients (immunocompromised patients including HIV, intravenous drug use, underlying advanced cancer, or post-splenectomy, documented multi-resistant bacteraemia or hospital - acquired infection, and older patients with advanced cardiorespiratory disease).

There is no evidence to support the belief that most oral medications are not as bioavailable as IV medications, or that the same agent must be used both IV and orally. The advent of newer, more potent or broad-spectrum oral agents can achieve higher and more consistent serum and tissue concentrations than IV antibiotics.[115] Moreover, earlier switchover from IV-to-oral therapy reduces the risk of cannula-related infections, carries no risk of thrombophlebitis, and may allow for earlier discharge.

Strategy: Recent trials have shown shorter courses of antibiotic therapy (~5-7 days), for a number of uncomplicated infections in immunocompetent patients, yield clinical outcomes just as good as those associated with longer courses (≥10 days). This conserves antimicrobial costs, minimises adverse antibiotic effects and reduces the emergence of antimicrobial resistance. Examples include community acquired pneumonia,[116,117] pyelonephritis,[118] infective exacerbations of chronic obstructive pulmonary disease,[119] and cellulitis.[120] For deep seated or opportunistic infections which may require prolonged IV antibiotics, consult an infectious diseases physician.

Do not diagnose and treat redness and swelling of both lower legs as bilateral cellulitis unless there is clear clinical evidence of sepsis such as malaise, fever and neutrophilia, plus an expanding area of redness or swelling.

Bilateral lower leg cellulitis is very rare. Most commonly the redness reflects an underlying inflammatory skin disorder such as venous eczema or a more deeply extending inflammation involving the subcutaneous fat known as lipodermatosclerosis.[121] This condition, which occurs more frequently in patients with venous insufficiency, who are overweight and immobile, may initially present as bilateral redness and swelling, and then progresses over time to produce scarring and hardening of the underlying tissues. A careful history and physical examination should be undertaken. An entry point for infection should be looked for, and swabs taken from open skin wounds. However, microbiological testing from intact overlying skin is of little value.

Strategy: An evidence-based pathway for cellulitis developed and endorsed by the SGMCN, Statewide Infectious Disease Network and the Queensland Emergency Department Strategic Advisory Panel is contained in **Appendix 9**.

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Hirschmann JV, Raugi GJ. Lower limb Cellulitis and its mimics: part 1 & II. Conditions that simulate lower limb cellulitis. J Am Acad Dermatol 2012; 67(2):163e1-163e12 and 177e1-177e9.

Antibiotics should not be prescribed for a leg ulcer in the absence of clinical features of infection; in such cases do not swab the ulcer either.

Lower leg ulcers, most commonly venous ulcers, are often treated with oral antibiotics, even in the absence of evidence of clinical infection. There is no evidence to support this use, except if screening for carriage of multi-resistant organisms. Also a swab for microscopy and culture, in the absence of signs of infection, is not recommended.[122]

Antibiotics should not be prescribed in patients with asymptomatic bacteriuria.

Antibiotic treatment of patients with asymptomatic bacteriuria (ASB), a condition not uncommon in older patients, is generally not indicated as it does not decrease the incidence of symptomatic urinary tract infection (UTI) and increases risk of adverse antimicrobial effects. This also includes patients with indwelling urinary catheters. Detection of ASB is common as up to two thirds of admitted patients receive a urinalysis despite 85% of these patients having no symptoms of UTI.[123] Even among older patients, non-specific symptoms combined with bacteriuria should not be relied upon to diagnose UTI; patients must still have dysuria, increased frequency or urgency, and urine microscopy which demonstrates significant pyuria.[124] Between 25% and 50% of antibiotic days for UTI are unnecessary treatment of ASB and incorrect diagnoses of UTI delays diagnosis of more important disease states, such as strokes, other infections, or adverse drug effects.[125] ASB frequently resolves without any treatment. Exceptions to this are pregnant women and those undergoing a urological procedure.[126,127]

Claims of antibiotic allergy should be validated in optimising choice of antibiotics

Overuse of alternative antibiotic therapy as a result of an inappropriate diagnosis of penicillin allergy based on self-report needs to be avoided. The label of penicillin allergy carries important risks for patients in that alternative antibiotics may be broader in coverage, more expensive, more toxic, less effective, and lead to more antibiotic resistance.[128] Among patients reporting penicillin allergies, 80% to 90% are not allergic when assessed by skin testing.[129] Recognizing the limitations of patient recall, certain historical features suggest immediate IgE-mediated reactions such as anaphylaxis, urticaria or angioedema, or severe delayed systemic reactions such as Stevens-Johnson syndrome and serum sickness.

Strategy: Guidelines are available that guide clinicians towards the most appropriate antibiotic according to the probability and severity of antibiotic allergy.[130]

Combination of anticoagulant and antiplatelet therapies for atrial fibrillation should be avoided in patients over 75 years of age with high falls risk

In patients with previous stroke or transient ischaemic attack, long-term aspirin use for secondary stroke prevention in the setting of concurrent anticoagulation for stroke prevention in atrial fibrillation (AF) is not indicated, In patients with AF and stable coronary artery disease, there is no clear evidence that adding antiplatelet agents to oral anticoagulants reduces risk of stroke, death, or myocardial infarction.[131] Combination anticoagulation and antiplatelet therapy fails to prevent more ischemic events than anticoagulation alone and is associated with a 50% increase in risk of major bleeding and bleeding-related

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[122] O'Meara S, Al-Kurdi D, Olugun Y, Antibiotics and antiseptics for venous ulcers. Cochrane Database Syst Rev 2014; CD003557.
[123] Yin P, Kiss A, Leis JA. Urinalysis orders among patients admitted to the general medicine service. JAMA Intern Med 2015;175(10):1711-1713.
[124] Rowe TA, Juthani-Mehta M. Urinary tract infection in older adults. Aging Health 2013;9(5).
[125] Trautner BW. Asymptomatic bacteriuria: when the treatment is worse than the disease. Nat Rev Urol 2012;9(2):85-93.
[126] Zalmanovici Trestioreaunu, Lador A, et al. Antibiotic treatment for asymptomatic bacteriuria. Cochrane Database Syst Rev 2015; (4): CD0009534.
[127] Jarvis TR, Chan L, Gottlieb T. Assessment and management of lower urinary tract infection in adults. Aust Prescr 2014;37:7-9.
[128] Picard M, Bégin P, Bouchard H, et al. Treatment of patients with a history of penicillin allergy in a large tertiary-care academic hospital. J Allergy Clin Immunol Pract 2013;1(3):252-257.
[129] Salkind AR, Cuddy PG, Foxworth JW. The rational clinical examination: is this patient allergic to penicillin? an evidence-based analysis of the likelihood of penicillin allergy. JAMA 2001;285(19):2498-2505.
[130] Blumenthal KG, Shenoy ES, Varughese CA, Hurwitz S, Hooper DC, Banerji A. Impact of a clinical guideline for prescribing antibiotics to inpatients reporting penicillin or cephalosporin allergy. Ann Allergy Asthma Immunol 2015;115(4):294-300.e2.
[131] Lip GYH, Banerjee A, Boriani G, et al. Antithrombotic therapy for atrial fibrillation: CHEST Guideline and expert panel report. Chest 2018;154(5):1121-1201.

hospitalizations.[132] The only clear indication for the use of antiplatelet and anticoagulation would be in patients with recent percutaneous coronary intervention (PCI) or medical history of mechanical heart valve replacement.

Triple oral antithrombotic therapy (TOAT) refers to the concurrent use of dual antiplatelet therapy (DAPT – aspirin and a P2Y12 receptor blocker) following PCI, and oral anticoagulation in patients with AF. As much as possible, TOAT should be avoided or reduced to a maximum duration of 6 months depending on the interplay of CHA2DS2-VASc and HAS-BLED scores in individual patients. Studies show TOAT increases bleeding risk up to 4-fold while not necessarily reducing thrombotic episodes.[133,134]

Thyroxine supplementation should not be prescribed to treat subclinical hypothyroidism

Subclinical hypothyroidism (SCH) has been defined as TSH level elevation with normal free thyroxine and triiodothyronine concentrations, irrespective of the presence or absence of signs or symptoms of thyroid dysfunction. In older patients, experts have proposed a higher upper limit of normal TSH levels (from 4.5 to 10.0 IU/mL in patients)[135] and thyroxine therapy in patients with TSH levels below 10 mIU/l has not been shown to improve symptoms, mortality or cognitive function.[136] Unnecessary thyroxine therapy can cause angina pectoris, atrial fibrillation, and iatrogenic hyperthyroidism (in up to 40% of cases[137]) with loss of bone mineral density and fractures.[138]

Supplemental oxygen flow rates in acute cardiorespiratory disease should be titrated to maintain arterial oxygen saturation (Sp02) between 90% and 94%, and no higher.

Supplemental high flow oxygen associated with Sp02 in excess of 94% is deleterious in patients with acute coronary syndromes,[139] exacerbations of chronic obstructive pulmonary disease (COPD),[140] acute stroke and cardiopulmonary resuscitation.[141]

Overuse of blood products

Administering packed red blood cell (PRBC) transfusions to a younger healthy patient with a haemoglobin of ≥70g/L who does not have on-going blood loss is not warranted, unless the patient is symptomatic or is haemodynamically unstable.

Recent trials show that a restrictive strategy (transfusion threshold Hb <70-90 g/L) versus a more liberal strategy (transfusion threshold Hb <90-130 g/L) resulted in fewer complications, and fewer PRBC transfusions, with no difference in risks for death, overall morbidity, fatal and nonfatal myocardial infarction, stroke, and kidney failure.[142] In patients with acute gastrointestinal tract bleeding, a more restrictive transfusion threshold (Hb <70 g/L) compared with a more liberal threshold (Hb <90 g/L) was associated

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[132] Steinberg BA, Kim S, Piccini JP, et al; ORBIT-AF Investigators and Patients. Use and associated risks of concomitant aspirin therapy with oral anticoagulation in patients with atrial fibrillation: insights from the Outcomes Registry for Better Informed Treatment of Atrial Fibrillation (ORBIT-AF) Registry. Circulation 2013;128(7):721-728.
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[136] Villar HC, Saconato H, Valente O, Atallah AN. Thyroid hormone replacement for subclinical hypothyroidism. Cochrane Database Syst Rev 2007;(3):CD003419.
[137] Somwaru LL, Arnold AM, Joshi N, et al. High frequency of and factors associated with thyroid hormone over-replacement and under-replacement in men and women aged 65 and over. J Clin Endocrinol Metab 2009;94(4):1342-1345.
[138] Chu JW, Crapo LM. The treatment of subclinical hypothyroidism is seldom necessary. J Clin Endocrinol Metab 2001;86(10):4591-4599.
[139] Stub D, Smith K, Bernard S, et al; AVOID Investigators. Air versus oxygen in ST-segment-elevation myocardial infarction. Circulation 2015;131(24):2143-2150.
[140] Austin M, Wills K, Blizzard L, et al. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial. BMJ 2010;341:c5462.
[141] Cornet AD, Kooter AJ, Peters MJ, Smulders YM. The potential harm of oxygen therapy in medical emergencies. Crit Care 2013;17(2):313-318.
[142] Holst LB, Petersen MW, Haase N, et al. Restrictive versus liberal transfusion strategy for red blood cell transfusion: systematic review of randomised trials with meta-analysis and trial sequential analysis. BMJ 2015;350:h1354.

with lower mortality and fewer rebleeding events.[143] Among patients with acute myocardial infarction, restrictive transfusional strategies decrease in-hospital and 30-day mortality, reinfarction, and worsening heart failure.[144] The decision to transfuse should be based on a combination of both haemoglobin level and assessment of the patient's clinical status, in particular, haemodynamic indicators, underlying cardiopulmonary or liver disease, and older age (>65 years).[145] Potential risks and harms associated with PRBC transfusions include pulmonary complications (where two or more units in succession is associated with an increase in pulmonary oedema or transfusion associated circulatory overload [TACO]), transfusion-related acute lung injury (TRALI), and acute transfusion reaction due to allergy. It is safe to give single unit transfusions with a restrictive transfusion trigger.

Fresh frozen plasma (FFP) is usually not indicated to correct elevated international normalized ratio (INR) prior to a procedure or in patients who are bleeding or at high risk of bleeding.

A mildly elevated INR (INR <1.8) does not predict a higher risk of bleeding, and FFP does not significantly change the INR value in this circumstance, and there is no evidence to support the use of prophylactic FFP in reducing bleeding risk. In patients who are actively bleeding, or at high risk of bleeding (eg INR >5 in older patients with chronic kidney disease or sepsis, INR >10 in younger healthy patients), or have INR >1.8 and require urgent operative procedures which pose risk of uncontrollable bleeding, prothrombin complex concentrate along with vitamin K (if patient is vitamin K deficient or receiving warfarin) has been shown to be more effective than FFP,[146] and can be delivered in smaller volumes with shorter transfusion times.[147] Similar to needless PRBC transfusions, unnecessary FFP transfusion increase risk of adverse events such as allergic reactions, TACO and TRALI.[148]

Overuse of procedures

Epidural steroid injections are not effective in patients with low back pain who do not have radicular leg pain or paraesthesia originating from the nerve roots.

Lumbar epidural steroid injections may provide limited short-term benefit (less than 3-6 months) for patients with an acute lumbar radiculopathy causing back pain and symptoms in the legs (low certainty evidence). When there is low back pain alone, the outcomes of epidural steroid injections are poor. Although serious adverse events are rare, catastrophic events can occur and any symptom relief from the injection is typically brief.[149]

Peripheral intravenous catheters do not need to be replaced unless clinically indicated.

Unnecessary removal and replacement of a functional IV catheter breaches skin integrity, posing an increased risk of healthcare-associated infection and trauma to patients. It also uses up nursing and medical staff time. Evidence suggests no significant difference in cases of phlebitis if peripheral IV catheters are closely monitored and replaced only when clinically indicated eg phlebitis, infiltration and blockage.[150] Routine use of paediatric size (20 and 22 gauge) IV catheters should be avoided as these

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[143] Villanueva C, Colomo A, Bosch A, et al. Transfusion strategies for acute upper gastrointestinal bleeding. N Engl J Med 2013;368 (1):11-21.
[144] Chatterjee S, Wetterslev J, Sharma A, et al. Association of blood transfusion with increased mortality in myocardial infarction: a meta-analysis and diversity-adjusted study sequential analysis. JAMA Intern Med 2013;173:132–139.
[145] Carson JL, Carless PA, Hebert PC. Transfusion threshold and other strategies for guiding allogeneic red blood cell transfusion (Review). Cochrane Database Syst Rev 2012;4:CD002042.
[146] Holbrook A, Schulman S, Witt DM, et al. Evidence-based management of anticoagulant therapy: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2012;141(2 suppl):e152S-84S.
[147] Goldstein JN, Refaai MA, Milling TJ Jr, et al. Four-factor prothrombin complex concentrate versus plasma for rapid vitamin K antagonist reversal in patients needing urgent surgical or invasive interventions: a phase 3b, open-label, non-inferiority, randomised trial. Lancet 2015;385 (9982):2077-2087.
[148] Yang et al, Is fresh frozen plasma clinically effective? An update of a systematic review of randomized controlled trials. Transfusion 2012; 52: 1673 – 86.
[149] Choi HJ, Hahn S, Kim CH, et al. Epidural steroid injection therapy for low back pain: a meta-analysis. Int J Technol Assess Health Care 2013;29(3):244-53.
[150] Webster J, Osborne S, Richard CM, New K. Clinically-indicated replacement versus routine replacement of peripheral venous catheters. Cochrane Database Syst Rev 2015 (8): CD007798.

have a shorter patency period compared to adult standard 18 gauge cannula which can also provide better access for blood product infusions.

Strategy: Adhere to local intravenous catheter management guidelines, including close attention to sterile technique at insertion, vigilant monitoring of the insertion site by medical and nursing staff, and immediate removal when no longer required reduces infective and other complications.[151]

Peripherally inserted central catheters (PICC lines) should not be placed, or left in place, for patient or clinician convenience.

PICCs can predispose to costly and potentially lethal health care-acquired complications, most commonly central-line associated bloodstream infection and venous thromboembolism.[152] Placement of PICCs should be limited to acceptable indications such as long-term peripherally compatible infusions, non-peripherally compatible infusions, chemotherapy, and infusions or clinically indicated frequent blood draws in patients lacking peripheral venous access. PICCs should be promptly removed when acceptable indications for their use ends, not left in just in case they may be needed again.

Urinary catheters should not be inserted to manage urinary incontinence unless all other appropriate options have proved to be ineffective. Urinary catheters should be removed as soon as no longer necessary.

Urinary tract infections (UTIs) are the most common healthcare associated infection, the majority of which are associated with the use of indwelling urinary catheters (IDC). Such infections increase morbidity and mortality, antibiotic exposure and often prolong length of hospital stay.[153] IDCs can also be associated with urethral injuries on insertion and lead to catheter related complications such as penile erosions.[154] Indications for longer term IDCs include patients with bladder outlet obstruction that is not relieved either medically or surgically, chronic urinary retention, skin breakdown (sacral decubitus ulcers of stage 3 or greater), or palliation.[155] IDCs should not be used for urinary incontinence or immobility as a convenience measure to patients and staff in the absence of documented indication for catheterization,[156]

Strategy: Indications for IDC insertion should be made explicit and clearly documented. The use of daily reminders, pre-ordered advance instructions, or automatic stop orders are each effective methods of ensuring that the appropriateness of continued use of IDCs is considered every day (**Appendix 10**).[157,158,159, 160] Diapers and external condom catheters are alternative options.[161]

Insertion of inferior vena cava filters (IVCFs) is not warranted in patients with venous thromboembolism (VTE) who are eligible for anticoagulation.

Current indications for IVCF insertion comprise patients with acute proximal deep venous thrombosis or

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[151] Pronovost P, et. al. An intervention to decrease catheter-related bloodstream infections in the ICU. N Engl J Med 2006;355:2725-32.
[152] Chopra V, Anand S, Krein SL, et al. Bloodstream infection, venous thrombosis, and peripherally inserted central catheters: reappraising the evidence. Am J Med 2012;125(8):733-74.
[153] Meddings J, Rogers AM, Krein SL, et al. Reducing unnecessary catheter use and other strategies to prevent catheter-associated urinary tract infection: an integrative review. BMJ Qual Saf 2013; 10; 1-3.
[154] Kashefi C, Messer K, Barden R, Sexton C, Parsons JK. Incidence and prevention of iatrogenic urethral injuries. J Urol 2008;179(6):2254-2257.
[155] Gould CV, Umscheid CA, Agarwal RK, et al. Healthcare Infection Control Practices Advisory Committee. Guideline for prevention of catheter-associated urinary tract infections 2009. Infect Control Hosp Epidemiol 2010;31(4):319-326.
[156] Cravens DD, Zweig S. Urinary catheter management. Am Fam Physician 2000;61(2): 369-376.
[157] Loeb M, Hunt D, O'Halloran K, et al. Stop orders to reduce inappropriate urinary catheterization in hospitalized patients: a randomized controlled trial. J Gen Intern Med 2008;23(6):816-820.
[158] Parry MF, Grant B, Sestovic M. Successful reduction in catheter-associated urinary tract infections. Am J Infect Control 2013;41(12):1178-1181.
[159] Meddings J, Rogers MAM, Macy M, Saint S. Systematic review and meta-analysis: reminder systems to reduce catheter-associated urinary tract infections and urinary catheter use in hospitalized patients. Clin Infect Dis 2010;51(5):550-60.
[160] Giles M, Watts W, O'Brien A, et al. Does our bundle stack up! Innovative nurse-led changes for preventing catheter-associated urinary tract infection (CAUTI). Healthc Infect 2015; 20: 62 –71.
[161] Saint S, Kaufman SR, Rogers MA, et al. Condom versus indwelling urinary catheters: a randomized trial. J Am Geriatr Soc 2006;54(7):1055-1061.

pulmonary thromboembolism with absolute contraindication for anticoagulation, or recurrent VTE despite adequate anticoagulation, and prior to pulmonary thromboendarterectomy. Trials have failed to demonstrate a favourable benefit-harm balance of IVCFs outside of the abovementioned indications,[162,163] including patients who have presented with haemodynamically unstable PTE with high volume iliofemoral DVT, or patients with past history of VTE requiring temporary discontinuation of oral anticoagulation. IVCFs are associated with procedural complications in up to 30% of patients, during placement or retrieval, of IVCF tilt or migration, IVC thrombosis or occlusion, IVC perforation, and filter fracture with fragment embolization.[164] Retrievable filters should be used preferentially and removed as soon as they are no longer required. Even if an IVCF has been placed, anticoagulation should be commenced as soon as feasible.

Vertebroplasty should not be routinely offered as a treatment for painful osteoporotic vertebral fractures.

Risks related to vertebroplasty include cement leakage which can cause pulmonary embolism, and nerve or cord compression. The procedure may be complicated by haemorrhage, infection, rib or sternal fracture or haemo- or pneumothorax. Conservative management should instead be offered including pain relief, bracing, and physiotherapy and normal healing takes place over 2-12 weeks.

Overuse of interventions in end of life care

Avoid unwarranted or unwelcomed aggressive or invasive care in patients with limited life expectancy (such as advanced cardiac, renal or respiratory failure, metastatic malignancy) in whom 'goals of care' have been discussed and preferences for alternative care focused on comfort and dignity have been clearly expressed.

Goals of medical care are to maintain, or return patients to, a quality of life that is acceptable to them. It is essential that clinicians explore the values and preferences of each patient within the context of advance care planning. Engaging with patients and their families in discussions around treatment limitations or withdrawal can improve the quality of dying and reduce family and staff stress and bereavement.[165] Offering choices about ineffective, futile treatment (essentially nonchoices), such as cardiopulmonary resuscitation or mechanical ventilation to patients and families at the end of life can cause conflict and regret in survivors because they feel accountable for this decision.[166]

Strategy: Clinicians should ask the 'surprise question' ie knowing all I know about this patient; would I be surprised if he/she were to die within the next 6 to 12 months? If the answer is no, then advance care plans should be considered which send the message that clinicians will continue to care for the patient, that the use of a futile intervention is not a matter that requires deliberation or ownership by surrogates, and to confirm that patients and carers understand and agree to the non-use of such interventions.[167]

Palliative care should not be delayed for a patient with serious illness just because they are pursuing disease-directed treatment.

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[162] Group TPS; PREPIC Study Group. Eight-year follow-up of patients with permanent vena cava filters in the prevention of pulmonary embolism: the PREPIC (Prevention du Risque d'Embolie Pulmonaire par Interruption Cave) randomized study. Circulation 2005;112(3):416-422.
[163] Mismetti P, Laporte S, Pellerin O, et al; PREPIC2 Study Group. Effect of a retrievable inferior vena cava filter plus anticoagulation vs anticoagulation alone on risk of recurrent pulmonary embolism: a randomized clinical trial. JAMA 2015;313(16):1627-1635.
[164] Duffett L, Carrier M. Inferior vena cava filters. J Thromb Haemost 2017;15(1):3-12.
[165] Detering KM, Hancock AD, Reade MC, Silvester W. The impact of advance care planning on end of life care in elderly patients: randomised controlled trial. BMJ 2010;340:c1345.
[166] Schenker Y, Crowley-Matoka M, Dohan D, Tiver GA, Arnold RM, White DB. I don't want to be the one saying 'we should just let him die': intrapersonal tensions experienced by surrogate decision makers in the ICU. J Gen Intern Med 2012;27(12):1657-1665.
[167] Blinderman CD, Krakauer EL, Solomon MZ. Time to revise the approach to determining cardiopulmonary resuscitation status. JAMA 2012;307(9):917-918.

Palliative care provides an added layer of support to patients with life-limiting disease and their families. Symptomatic patients can benefit regardless of their diagnosis, prognosis or disease treatment regimen. Studies show that integrating palliative care with disease-modifying therapies improves pain and symptom control, as well as patient quality of life and family satisfaction. Early access to palliative care has been shown to reduce aggressive therapies at the end of life, prolong life in certain patient populations, and significantly reduce hospital costs.[168,169]

Percutaneous endoscopic gastrostomy (PEG) tubes should be avoided in patients with advanced terminal illness.

Placement of PEG tubes in patients with advanced terminal illness, including advanced dementia, lacks clear benefits and may carry risk of substantial harm. In a community-based cohort of patients with PEG tube placements, 70% had no clinically significant improvement in functional, nutritional, or health status.[170] Major PEG-associated complications occur in about 10% of procedures comprising aspiration, PEG tube dislodgement, postoperative bleeding, visceral injury, and cardiac arrest.[171] Minor complications include infection and tube-feeding intolerance.

Strategy: Shared decision-making necessitates explicit discussion with patients and carers regarding the patient's clinical condition, prognosis, goals of care, and the likelihood that a PEG tube will result in any benefits or harms. This is important as surrogate decision makers often hold the belief that that feeding tubes would improve quality of life and independence, reduce risk of pneumonia, and lead to overall health improvement.[172]

Nil by mouth (NBM) orders should be avoided or kept to a minimal duration unless there is high risk of aspiration.

Pre-operative NBM orders (eg. no solid food for 6 hours prior and no liquids for 2 to 4 hours prior to procedure) are frequently applied in nonsurgical settings and used for a variety of imaging studies. For older malnourished patients, such orders may be potentially inappropriate. Evidence suggests up to 25% of NBM orders are not clinically justified or are extended longer than is recommended, with up to one half of missed meals due to NBM status being deemed avoidable in one study.[173] A common driver of NBM orders is the belief they reduce the risk of aspiration events, or, in the case of abdominal ultrasound investigations, improve image quality. However, evidence supporting aspiration as a significant risk in patients on NBM orders who do not have gastro-oesophageal or intestinal obstruction is very limited,[174] and image quality in a non-fasted state does not appear to be inferior to that when NBM orders are applied.[175]

Overuse of interventions in perioperative medicine

Cardiovascular testing is rarely indicated in patients at low risk for major adverse cardiovascular events.

A complete history, clinical risk stratification (using tools such as the Revised Cardiac Risk Index), and careful patient selection can identify the vast majority of patients who do not require preoperative testing while still selecting the small subgroup of patients at excessive risk (eg. inability to climb ≤2 flights of stairs,

[168] Greer JA, Pirl WF, Jackson VA, et al. Effect of early palliative care on chemotherapy use and end-of-life care in patients with metastatic non-small-cell lung cancer. J Clin Oncol 2012;30(4):394-400.
[169] Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med 2010;363(8):733-42.
[170] Callahan CM, Haag KM, Weinberger M, et al. Outcomes of percutaneous endoscopic gastrostomy among older adults in a community setting. J AmGeriatr Soc 2000;48(9):1048-1054.
[171] Keung EZ, Liu X, Nuzhad A, et al. In-hospital and long-term outcomes after percutaneous endoscopic gastrostomy in patients with malignancy. J AmColl Surg 2012;215(6):777-786.
[172] Carey TS, Hanson L, Garrett JM, et al. Expectations and outcomes of gastric feeding tubes. Am J Med 2006;119(6):e11-e16.
[173] Sorita A, Thongprayoon C, Ahmed A, et al. Frequency and appropriateness of fasting orders in the hospital. Mayo Clin Proc 2015; 90(9): 1225-1232.
[174] Stuart PC. The evidence base behind modern fasting guidelines. Best Pract Res Clin Anaesthesiol 2006;20(3):457-469.
[175] Sinan T, Leven H, Sheikh M. Is fasting a necessary preparation for abdominal ultrasound? BMC Med Imaging 2003;3(1):1.

which is <4 metabolic equivalent tasks) in whom results of testing would change the perioperative medical, anaesthesia, or surgical approaches.[176]

Routine perioperative use of low-dose aspirin does not decrease cardiovascular events but does increase surgical bleeding.

Low-dose aspirin may be appropriate for a subset of patients when ischemic risks outweigh the bleeding risks, such as for patients with coronary artery stents.[177,178]

Routine use of β-blockers administered just prior to surgery are associated with a higher risk of stroke and mortality and should be avoided.

Patients already receiving β-blockers for an established indication should continue treatment during the perioperative period in the absence of bradycardia or hypotension. Initiation of β-blockers before surgery may be warranted in select patients with coronary artery disease or with multiple vascular risk factors who are at high risk for perioperative myocardial infarction, as indicated by a Revised Cardiac Risk score of 3 or more.

Bridging anticoagulation in the perioperative period is not indicated in patients with atrial fibrillation and CHADs2 score <5 and no additional risk factors for stroke.

Patients with mechanical mitral valves or those at increased risk for thromboembolic events with mechanical aortic valves usually require bridging anticoagulation. Patients treated with direct oral anticoagulant (DOAC) therapy generally do not require bridging therapy as the period of interruption is relatively short (2-3 days), although surgery with very high bleeding risk requiring longer periods of cessation (eg neurosurgery) may be exceptions. Patients treated with warfarin for atrial fibrillation with high embolic risk (CHADs2 score 5 or more; recent [<3 months] stroke or transient ischaemic attack (TIA); prior stroke or TIA during temporary interruption of anticoagulants) require careful consideration of individualised bleeding and thromboembolism risk to inform a bridging anticoagulation decision prior to noncardiac surgery. Otherwise bridging anticoagulation is not indicated and simply increases risk of bleeding without reducing thromboembolic risk. In patients at high risk of thromboembolic complications, review of the benefits of the procedure should accompany decisions regarding bridging therapy. Minor surgery with low bleeding risk does not, in general, require interruption of anticoagulation therapy.

Pre-operative chest X-rays, ECGs and rest echocardiography should not be routinely performed in adult elective surgical patients.

Such investigations should not be routinely performed in low-risk, non-cardiac, adult elective surgical patients. They are labour intensive, produce spurious results and may cause anxiety for patients, delays in treatment and further unnecessary investigation or treatment. Pre-operative ECGs are appropriate in specific circumstances, for example patients with a history of cardiovascular or renal disease, or diabetes. Pre-operative chest X-rays are appropriate in specific circumstances, for example people undergoing cardiac or thoracic surgery. Pre-operative echocardiography should only be performed in patients with known cardiac disease who have an unexplained worsening in cardiac status prior to surgery.[179]

Routine coronary revascularization does not reduce perioperative risk and should not be performed without specific indications relating to acute coronary syndromes independent of planned surgery.

Even among patients with multivessel disease, revascularization prior to noncardiac surgery has not been demonstrated to improve outcomes. Once invasive testing reveals disease, clinicians must overcome the

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[176] Sheffield KM, McAdams PS, Benarroch-Gampel J, et al. Overuse of preoperative cardiac stress testing in Medicare patients undergoing elective noncardiac surgery. Ann Surg 2013;257(1):73-80.
[177] Smilowitz NR, Berger JS. Perioperative cardiovascular risk assessment and management for noncardiac surgery. A review. JAMA 2020;324(3):279-290.
[178] Scott IA, Shohag HA, Kam PCA, Jelinek MV, Khadem GM. Preoperative evaluation and management of cardiac risk in patients undergoing elective non-cardiac surgery. Med J Aust 2013; 199: 667-673.
[179] Wijeysundera DN, Beattie WS, Karkouti K, et al. Association of echocardiography before major elective non-cardiac surgery with postoperative survival and length of hospital stay: population based cohort study. *BMJ* 2011;342:d3695.

diagnostic-therapeutic cascade, in which treatment decision making reflects diagnostic testing itself, not anticipated treatment benefit or potentially the clinical circumstance of the individual patient.

Strategies for reducing low benefit care

Having characterised a number of common LBC practices, the next step is to consider what may be the causes of LBC which informs the selection of strategies that could be deployed to counter them (often termed 'de-implementation' or 'de-adoption' strategies). The drivers of LBC are multidimensional and poorly understood. Medicolegal concerns, patient expectations, difficulty accessing medical records, need for rapid patient flow, and a preference to use investigative and therapeutic technologies because of their ready availability within hospitals are commonly cited drivers.[180,181] Four basic remedial approaches could be deployed.

Knowledge translation strategies for clinicians

Traditional knowledge translation strategies comprise:

- Educational interventions (dedicated education sessions, academic detailing, educational visits), which address lack of knowledge and skills, and try to tackle beliefs and attitudes acting as barriers to change.[182]
- Clinical practice guidelines (including this document) which address lack of guidance and fear of change due to absence of permission from respected authorities to change current practice. Unfortunately, most clinical guidelines focus on escalation of care rather than de-intensification or de-adoption of care that is not conferring benefit, and rarely specify the eligible population for which a particular practice is not indicated, or how, in the case of treatments, to taper and cease those that are no longer appropriate.[183]
- Audit and feedback which address lack of awareness of LBC and mismatch between perceived and actual prevalence of LBC within the practice of a unit or of individual clinicians.[184]
- Process standardization whereby protocols, pathways and algorithms are used to emphasise key decision points in avoiding LBC.[185]
- Clinical decision support (alerts, prompts, algorithms, electronic medical record mediated decision support) which signal the inappropriateness of specific clinical decisions at the point of care.
- Economic disincentives where remuneration for certain forms of low value care is withdrawn or subject to prior authorisation.[186]

While all these strategies attract evidence of effectiveness which varies according to specific forms of low benefit care,[187] their absolute effects on behaviour are modest (eg. median increase 2 to 10 percentage points in evidence-concordant care[188]), suggesting attitudes, habits, culture, and availability

[180] Lyu H, Xu T, Brotman D, Mayer-Blackwell B, et al. Overtreatment in the United States. PLoS One 2017; 12: e0181970.
[181] Colla CH, Kinsella EA, Morden NE, et al. Physician perceptions of choosing wisely and drivers of overuse. Am J Manag Care 2016; 22: 337–43.
[182] Stammen LA, Stalmeijer RE, Paternotte E, et al. Training physicians to provide high value, cost-conscious care: a systematic review. JAMA 2015;314(22):2384–400.
[183] Markovitz AA, Hofer TP, Froehlich W, et al. An examination of deintensification recommendations in clinical practice guidelines: stepping up or scaling back? JAMA Intern Med 2018; 178(3): 414-416.
[184] Ivers N, Jamtvedt G, Flottorp S, et al. Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database Syst Rev 2012;6:CD000259.
[185] Morelli MS. Using the plan, do, study, act model to implement a quality improvement program in your practice. Am J Gastroenterol 2016;111(9):1220–2.
[186] Powers BW, Jain SH, Shrank WH. De-adopting low-value care: evidence, eminence, and economics. JAMA 2020. Oct 2 on-line.
[187] Colla CH, Mainor AJ, Hargreaves C, et al. Interventions aimed at reducing use of low-value health services: a systematic review. Med Care Res Rev 2017; 74: 507–50.
[188] Lau R, Stevenson F, Ong BN, et al. Achieving change in primary care--effectiveness of strategies for improving implementation of complex interventions: systematic review of reviews. BMJ Open 2015; 5(12): e009993.

of resources, as well as awareness and knowledge, influence what clinicians choose to do.[189][190,191,192] Recent overseas studies suggest that professionally led campaigns to reduce LBC which are predicated on such strategies, and on which Choosing Wisely Australia (CWA) and the Royal Australasian College of Physicians EVOLVE programs are based, have to date yielded marginal improvements.[193,194, 195,196]

Sociocognitive strategies for clinicians

Other commentators suggest sociocognitive biases in individual clinician decision making are major promoters of LBC, and that strategies aimed at countering such biases may be more effective. [197,198,199] Biases such as commission bias and loss aversion strongly influence clinicians and patients, and make the action of stopping a practice feel difficult compared with the relative ease of implementing new practices.[200] Such de-biasing strategies include:

- Use of countervailing mental rules of thumb (or heuristics) and meta-cognitive approaches (thinking about one's thinking) which draw out and counter hidden and often unappreciated biases in decision-making.
- Cognitive huddles and 'autopsies' where examples of LBC are identified and examined within a group of peers in a non-judgmental, non-confrontational environment.
- Profiling of narratives of patient harm caused by LBC which elicit emotional responses ('grabs the heart as well as the mind') and engenders stronger motivation to do better next time.
- Explicit statement by clinicians of the expected benefit, from the patient's perspective, of a proposed intervention which is documented in the clinical notes, thereby obliging clinicians to consciously weigh up its benefits and harms for individual patients
- Profiling high value alternatives that can substitute for LBC, thereby negating clinician temptation to continue providing LBC because 'what else can I do?'
- Deliberate and routine reflection on routine practice and role modelling avoidance of LBC to colleagues and, in particular, junior staff.
- Normalisation of deviance to the status quo in that clinicians challenge what they perceive as LBC, without being ostracised or reprimanded for doing so.
- Peer benchmarking coupled with practical accounts of how respected colleagues elsewhere have learnt to discontinue certain practices without incurring harm to patients.
- Use of various 'nudge' strategies, gamification techniques and default options to direct clinician behaviour away from LBC while preserving autonomy and freedom of choice.

Evidence that these strategies work is evolving but most have considerable face validity and, for some,

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[192] Sears ED, Caverly TJ, Kullgren JT, et al. Clinicians' perceptions of barriers to avoiding inappropriate imaging for low back pain-knowing is not enough. JAMA Intern Med 2016;176(12):1866–8.
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[194] Niven DJ, Rubenfeld GD, Kramer AA, et al. Effect of published scientific evidence on glycemic control in adult intensive care units. JAMA Intern Med 2015; 175: 801–9.
[195] Hong AS, Ross-Degnan D, Zhang F, Wharam JF. Small decline in low-value back imaging associated with the 'Choosing Wisely' campaign, 2012-14. Health Aff (Millwood) 2017;36(4):671-679.
[196] Henderson J, Bouck Z, Holleman R, et al. Comparison of payment changes and Choosing Wisely recommendations for use of low-value laboratory tests in the United States and Canada. JAMA Intern Med 2020;180(4):524-531.
[197] Scott IA, Soon J, Elshaug A, Lindner R. Countering cognitive biases in minimising low value care. Med J Aust 2017; 209: 407–11.
[198] Scott IA, McPhail S. A sociocognitive approach to behaviour change for reducing low value care. Aust Health Rev 2020 (in press).
[199] Navathe AS, Volpp KG, Bond AM. Assessing the effectiveness of peer comparisons as a way to improve health care quality. Health Aff 2020; 39(6): 852-861.
[200] van Bodegom-Vos L, Davidoff F, Marang-van de Mheen PJ. Implementation and de-implementation: two sides of the same coin? BMJ Qual Saf 2017;26:495-501.

effectiveness in reducing LBC has been demonstrated in randomised trials.[201,202]

Patient mediated strategies

A third approach is to empower patients to question their clinicians about the value of proposed interventions in the course of everyday clinical interactions. Clinicians often cite patient demand for tests and treatments as a barrier to reducing LBC,[203] and worry that involving patients in efforts to reduce LBC may impute mistrust within the patient-clinician interaction and create a false sense of the ubiquity of LBC within clinical practice. However, many patients perceive the negative consequences of overuse,[204] and wish to be proactive in avoiding such consequences.

De-implementation interventions that engage patients within the patient-clinician interaction comprise: [205]

- Patient-targeted educational materials (eg leaflets, factsheets)
- Shared decision-making (SDM) which involves
    - training in communication techniques
    - use of multidisciplinary teams
    - deployment of trained decision coaches
    - use of patient decision aids, action plans, option grids
- Pubic messaging (eg posters affixed to clinic walls listing key questions patients can ask of their clinicians) which encourages and legitimates patient engagement (**Appendix 11).**[206]

These patient-mediated interventions lessen expectations that more care is always better care, and have been shown to reduce LBC by 25% to 40%.[206] Evidence-based strategies exist to support clinicians and patients in engaging in SDM,[207] and engagement is further facilitated and overuse reduced within long term clinician-patient relationships characterised by mutual trust and continuity of care.[208]

System of care changes

Successful implementation of the recommendations listed above will require improvement of systems within hospitals to drive reliability.[209] Importantly, interdisciplinary teams comprising doctors, nurses, allied health professionals and clinical pharmacists will need to assess the current practice patterns within their services prior to implementing solutions that standardize and, where possible, automate the ordering processes for tests and treatments.[210] Additionally, the culture within individual patient care units will need to be modified.[211] Alternative care pathways and care delivery technologies such as

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[201] Meeker D, Knight TK, Friedberg MW, et al. Nudging guideline-concordant antibiotic prescribing: a randomized clinical trial. JAMA Intern Med 2014; 174: 425-431.
[202] Meeker D, Linder JA, Fox CR, et al. Effect of behavioural interventions on inappropriate antibiotic prescribing among primary care practices: a randomized clinical trial. JAMA 2016; 315: 562-570.
[203] Zikmund-Fisher BJ, Kullgren JT, Fagerlin A, et al. Perceived barriers to implementing individual Choosing Wisely® recommendations in two national surveys of primary care providers. J Gen Intern Med 2017;32:210–7.
[204] Green AR, Tung M, Segal JB. Older adults' perceptions of the causes and consequences of healthcare overuse: A qualitative study. J Gen Intern Med 2018; 33(6):892–7.
[205] Sypes EE, de Grood C, Whalen-Browne L, et al. Engaging patients in de-implementation interventions to reduce low-value clinical care: a systematic review and meta-analysis. BMC Med 2020;18(1):116.
[206] Sarrami-Foroushani P, Travaglia J, Debono D, et al. Key concepts in consumer and community engagement: a scoping meta-review. BMC Health Serv Res 2014;14:250.
[207] Hoffmann TC, Légaré F, Simmons MB, et al. Shared decision making: what do clinicians need to know and why should they bother? Med J Aust 2014; 201 (1): 35-39.
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[210] Woodward HI, Mytton OT, Lemer C, et al. What have we learned about interventions to reduce medical errors? Annu Rev Public Health 2010;31:479–497.
[211] Pronovost PJ, Vohr E. *Safe Patients, Smart Hospitals: How One Doctor's Checklist Can Help Us Change Health Care From The Inside Out*. New York, NY: Hudson Street Press; 2010.

telehealth, home-based care, and community-based care can provide alternatives to low benefit inpatient or outpatient hospital care.[212] Quality and safety programs within hospitals also need to be reformed in that reducing LBC has not been their traditional focus, instead they have placed priority, and with justification, on reducing the underuse of effective and needed therapies. Guidelines and performance measures used in determining if a patient received an intervention inappropriately require a much more detailed set of clinical criteria than those required for assessments of underuse. The challenge of changing the behaviour of multiple stakeholders and hardwiring systems changes represent significant potential barriers to success. Hospital accreditation agencies such as the Australian Council of Healthcare Standards should include standards concerning avoidance of low benefit care, as currently their focus on patient safety might even be fueling the ongoing escalation of medical overuse to some extent.[213] De-implementation research shows that both top-down organisational changes are required alongside grassroots efforts targeting different groups, with medical practice culture playing a vital role.[214]

Multicomponent strategies

It is likely that a combination of these four types of strategy will be more effective in reducing LBC than any one in isolation. The CWA and EVOLVE programs have numerous resources on their websites that are relevant to all four. However changing clinician behaviour towards reducing LBC is not easy – it incites fear of losing control, more uncertainty, unease with surprise, and cognitive dissonance when a practice an individual has internalised as being necessary and evidence-based in a particular clinical scenario actually turns out to be of no value or even harmful.[215] Many initiatives aimed at changing behaviour fail because the motivations and human behaviours that resist change are not directly addressed.[216]

A detailed discussion of how to design, conduct, evaluate, scale up and sustain change management projects that target particular LBC practices is beyond the scope of this guidance document. However, in **Appendix 12** we provide a generic approach to designing, implementing and evaluating a practice change intervention.[217] Several useful toolkits and other resources that can assist in any change intervention are listed in the **Appendix 13.** However, to be successful, local projects should follow four fundamental principles:[218,219]

- identify, using data, high-priority clinical targets for intervention based on prevalence and potential impact ie ensuring the low value practice is worth the effort?
- develop and implement theory-based multilevel interventions that target the root causes of specific forms of LBC which decrease the low benefit use of an intervention while preserving its high value use ie. avoid any unintended consequences from limiting the provision of a practice to those who would actually receive benefit;
- design rigorous and pragmatic approaches to test, implement, and evaluate these interventions, assess enablers and barriers, and measure clinically meaningful outcomes (see below), all in ways that promote dissemination and adoption by others ie. maximising the spread of an intervention beyond one single area or service or hospital.

[212] Orlando JF, Beard M, Kumar S. Systematic review of patient and caregivers' satisfaction with telehealth videoconferencing as a mode of service delivery in managing patients' health. PLoS One 2019;14(8):e0221848.
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[214] Mafi JN, Parchman M. Low-value care: an intractable global problem with no quick fix. BMJ Qual Saf 2018; 27:333-6.
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[217] Scott IA, Scott IA, Kallie J, et al. Achieving greater clinician engagement and impact in health care improvement: an unmet imperative. Med J Aust 2020; 212(1): 5-7.
[218] Kerr EA, Kullgren JT, Saini SD. Choosing Wisely: How to fulfill the promise in the next 5 years. **Health Aff 2017;** 36 (11): 2012-2018.
[219] Soong C, Cho HJ, Shojania KG. Choosing quality problems wisely: identifying improvements worth developing and sustaining. BMJ Qual Saf 2020; 29: 790-793.

- convene collaborative multi-stakeholder groups for LBC recommendations that cut across disciplinary or service interfaces (eg in targeting overuse of CTPA involve emergency physicians and radiologists as it is not general physicians alone who can influence the ordering of this investigation) ie. building capacity to influence behaviour change across multiple disciplines.

At the very least, the SGMCN Steering Committee strongly encourages all members to disseminate this document to all clinical staff from all disciplines and from all specialties with whom they interact, including medical students, refer to its recommendations on ward rounds, multidisciplinary team meetings, teaching sessions, and practice vivas, and use it to pursue change management projects that target LBC practices that are commonly seen within their spheres of influence.[220] The SGMCN has been recognised by Queensland Health as a leader in efforts to reduce LBC and the SGMCN Steering Committee is keen to build an inventory of projects undertaken by members that have successfully reduced LBC, and to showcase success stories with members at future forums.

Evaluation of effectiveness of strategies for reducing low benefit care

Any initiative aimed at reducing LBC should incorporate an evaluation framework that attempts to include meaningful outcome measures. Most published studies of interventions for reducing LBC focus on reductions in utilization, as opposed to clinically relevant measures (e.g., improvements in appropriateness, clinical attitudes or awareness, patient-reported outcomes) or unintended consequences.[221] Data that may be collected can be qualitative (eg. survey that asks why and when a test or treatment is performed) or quantitative (eg. data extract that shows how often a test or treatment is being performed). The population being evaluated can include clinicians, individual teams or units (departments), whole hospitals or health service patients/consumers.

An integrated evaluation framework can include measures of provider attitudes and awareness (eg, physician surveys, structured interviews), provider ordering behaviour (eg. administrative databases, electronic health record/chart data, and patient perceptions and outcomes (eg. patient-reported experience measures [PREMs] and outcomes [PROMs] using validated survey tools).[222]

Evaluation has three key purposes: to assist with project design to identify the causes of the clinical problem to help determine which interventions (eg education, audit and feedback, etc.) will be implemented; to assess progress and measure success of a change management project; and to make the case for sustaining the change in practice into the future.

But there are challenges. First is the lack of systematic monitoring of practice, which is an essential procedure if you want to measure the real impact of any LBC reduction campaign. Second, LBC recommendations listed in this document must be translated into valid quality indicators to assess their effect on behaviour change. Third, nuanced clinical circumstances necessary to deciding if an intervention is inappropriate are often not documented or captured in routinely collected administrative databases or even electronic health records that are usually used as data sources for performance metrics. Fourth, while variation between clinicians in use of interventions when applied to similar patient populations may indicate overuse on the part of some, it may also include underuse on the part of others.

It is beyond the scope of this document to give a detailed discussion of evaluation strategies and instead

[220] Lakhani A, Lass E, Silverstein WK, et al. Choosing Wisely for medical education: Six things medical students and trainees should question. Acad Med 2016;91(10):1374-1378.

[221] Maratt JK, Kerr EA, Klamerus ML, et al. Measures used to assess the impact of interventions to reduce low-value care: a systematic review. J Gen Intern Med 2019; 34(9):1857-1864.

[222] Bhatia RS, Levinson W, Shortt S, et al. Measuring the effect of Choosing Wisely: an integrated framework to assess campaign impact on low-value care. BMJ Qual Saf 2015;24: 523–531.

the reader is referred to the resources contained in **Appendix 13**.

Future directions

Looking forward, we need to expand the spectrum of what has been identified as LBC on the basis of evolving evidence, and revise and adapt de-implementation strategies as required on the basis of evidence of effectiveness. Clinical science evolves rapidly and the median half-life of knowledge underpinning current practice guidelines has been estimated at no more than 5.5 years.[223] Within the last 30 years, almost 400 commonly used practices have been discontinued by the clinical community because of mounting evidence of ineffectiveness or harm.[224] These examples often occur as a medical 'reversal', when a therapy adopted without strong evidence in the first place is later shown to be ineffective in a well-designed randomized trial. Sometimes, therapies once supported by robust evidence are proven to no longer work because of changing population risk, newly adopted adjunctive medical therapy, and, for screening interventions, more effective treatments, which obviate the gains from early detection. A cyclic re-assessment of clinical interventions using observational practice data and findings of new clinical trials is a necessary next step for evidence-based medicine. Only by periodically checking whether interventions are still working can clinicians confidently treat their patients in a manner built on a solid foundation of reliable and up-to-date evidence.[225]

Conclusion

LBC is a significant and growing problem that threatens both patient health and the sustainability of the healthcare system as a whole. Older patients who are frail or who have multiple co-morbidities, and whose care is within the remit of general medicine clinicians, are more vulnerable to harm as a result of LBC. In light of this responsibility and given the orientation of general medicine clinicians towards being responsible stewards of limited healthcare resources,[226] it is paramount that all members of the SGMCN do their best in countering LBC wherever they perceive it.

[223] Shojania KG, Sampson M, Ansari MT, et al. How quickly do systematic reviews go out of date? A survival analysis. Ann Intern Med 2007;147(4):224-33.
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[226] Scott IA, Phelps G, Dalton S. Arise the systems physician. Intern Med J 2014; 44: 1251-1256.

Appendices

Appendix 1. Shapiro decision rule for assessing indications for blood cultures*

Major Criteria	Minor Criteria (1 point each)
Suspect endocarditis (3 points)	Temperature 38.3–39.3°C (101.0–102.9°F)
Temperature > 39.4°C (103.0°F) (3 points)	Age > 65 years
Indwelling vascular catheter (2 points)	Chills
	Vomiting
	Hypotension (systolic blood pressure < 90 mm Hg
	White blood cell count > 18,000 cells/mm^3
	Bands > 5%
	Platelets < 150,000 cells/mm^3
	Creatinine > 2.0 mg/dL

Either 1 major criterion or 2 or more minor criteria is an indication to obtain a blood culture. If these are not present, a blood culture is not indicated by the rule. Creatinine >150 mmol/l is equivalent to >2.0 mg/dL.

*Shapiro NI, Wolfe RE, Wright SB, et al. Who needs a blood culture? a prospectively derived and validated prediction rule. J Emerg Med 2008;35(3):255-264

Appendix 2. Canadian Syncope Risk Score*

Category	Points
Clinical evaluation	
Predisposition to vasovagal symptoms[a]	−1
History of heart disease[b]	1
Any systolic pressure reading <90 or >180 mm Hg[c]	2
Investigations	
Elevated troponin level (>99th percentile of normal population)	2
Abnormal QRS axis (<−30° or >100°)	1
QRS duration >130 ms	1
Corrected QT interval >480 ms	2
Diagnosis in emergency department	
Vasovagal syncope	−2
Cardiac syncope	2
Total score (−3 to 11)	

[a] Triggered by being in a warm crowded place, prolonged standing, fear, emotion, or pain.

[b] Includes coronary or valvular heart disease, cardiomyopathy, congestive heart failure, and nonsinus rhythm (electrocardiogram evidence during index visit or documented history of ventricular or atrial arrhythmias, or device implantation).

[c] Includes blood pressure values from triage until disposition from the emergency department.

Total score	Estimated risk of serious adverse event,§ %	Risk category
−3	0.4	Very Low
−2	0.7	Very Low
−1	1.2	Low
0	1.9	Low
1	3.1	Medium
2	5.1	Medium
3	8.1	Medium
4	12.9	High
5	19.7	High
6	28.9	Very High
7	40.3	Very High
8	52.8	Very High
9	65.0	Very High
10	75.5	Very High
11	83.6	Very High

§ Shrinkage-adjusted expected risk

*Score estimates risk serious adverse event at 30 days

Reference: Thiruganasambandamoorthy et al. JAMA Intern Med 2020;180(5):737-744.

Appendix 3. Risk stratification scores for patients presenting with chest pain

HEART score

Variable	Score of 0	Score of 1	Score of 2
History	nonspecific history for ACS, a history that is not consistent with chest pain concerning for ACS	mixed historic elements, a history that contains traditional & non-traditional elements of typical ACS presentation	specific history for ACS, a history with traditional features of ACS
Electrocardiogram	entirely normal ECG	abnormal ECG, with repolarization abnormalities[a] yet lacking significant ST depression	abnormal ECG, with significant ST deviation (depression ± elevation), either new or not known to be old (i.e., no prior ECG available for comparison)
Age (years)	age less than 45 years	age between 45 & 64 years	age 65 years or older
Risk Factors[b]	no risk factors	1 to 2 risk factors	3 or more risk factors OR documented cardiac or systemic atherosclerotic vascular disease[c]
Troponin[d]	troponin < discriminative level level ± AccuTroponin I < 0.04 ng/ml	troponin elevated 1–3 times discriminative level ± AccuTroponin I 0.04–0.12 ng/ml	troponin elevated > 3 times discriminative level ± AccuTroponin I > 0.12 ng/ml

Total HEART Score: risk category & recommended management strategy.
0-3: low risk, potential candidate for early discharge.
4-6: moderate risk, potential candidate for observation & further evaluation.
7-10: high risk, candidate for urgent or emergent intervention.

[a] BBB, LVH, digoxin effect, implanted right-ventricular pacemaker, past MI, +/– unchanged repolarization abnormalities.
[b] DM, tobacco smoker, HTN, hypercholesterolemia, obesity, +/– family history of CAD.
[c] peripheral arterial disease, MI, past coronary revascularization procedure, +/– stroke.
[d] It is recommended to use the local hospital standards for troponin abnormality determination.

TIMI score

TIMI score	Yes 1 point	No 0 points
Age ≥65		
≥3 risk factors for ACS; hypertension, hyperlipidemia, smoking, diabetes, family history		
Use of aspirin in last 7 days		
Prior coronary stenosis ≥50%		
≥2 angina events in 24 hours or persisting discomfort		
ST-segment deviation of ≥0.05 mV on initial ECG		
Elevated cardiac biomarkers		
Total score		

Cut-point: Low risk = 0-2 points; High risk = 3-7 points

Appendix 4. Indications for telemetry in non-ICU, non-CCU acute medical unit settings*

Supraventricular tachycardia

- heart rate >120bpm (includes atrial fibrillation or atrial flutter) or symptomatic or haemodynamic instability

Bradycardia

- heart rate <40 bpm or symptomatic or haemodynamic instability

Acute heart failure on parenteral therapy

Acute coronary syndrome

- STEMI, NSTEMI, unstable angina

Syncope with suspected cardiac cause

Acute stroke for detection of underlying atrial fibrillation

Prolonged QTC monitoring

- medication or intoxication requiring cardiac monitoring

Acute electrolyte abnormality with ECG changes

Pulmonary embolism with haemodynamic instability

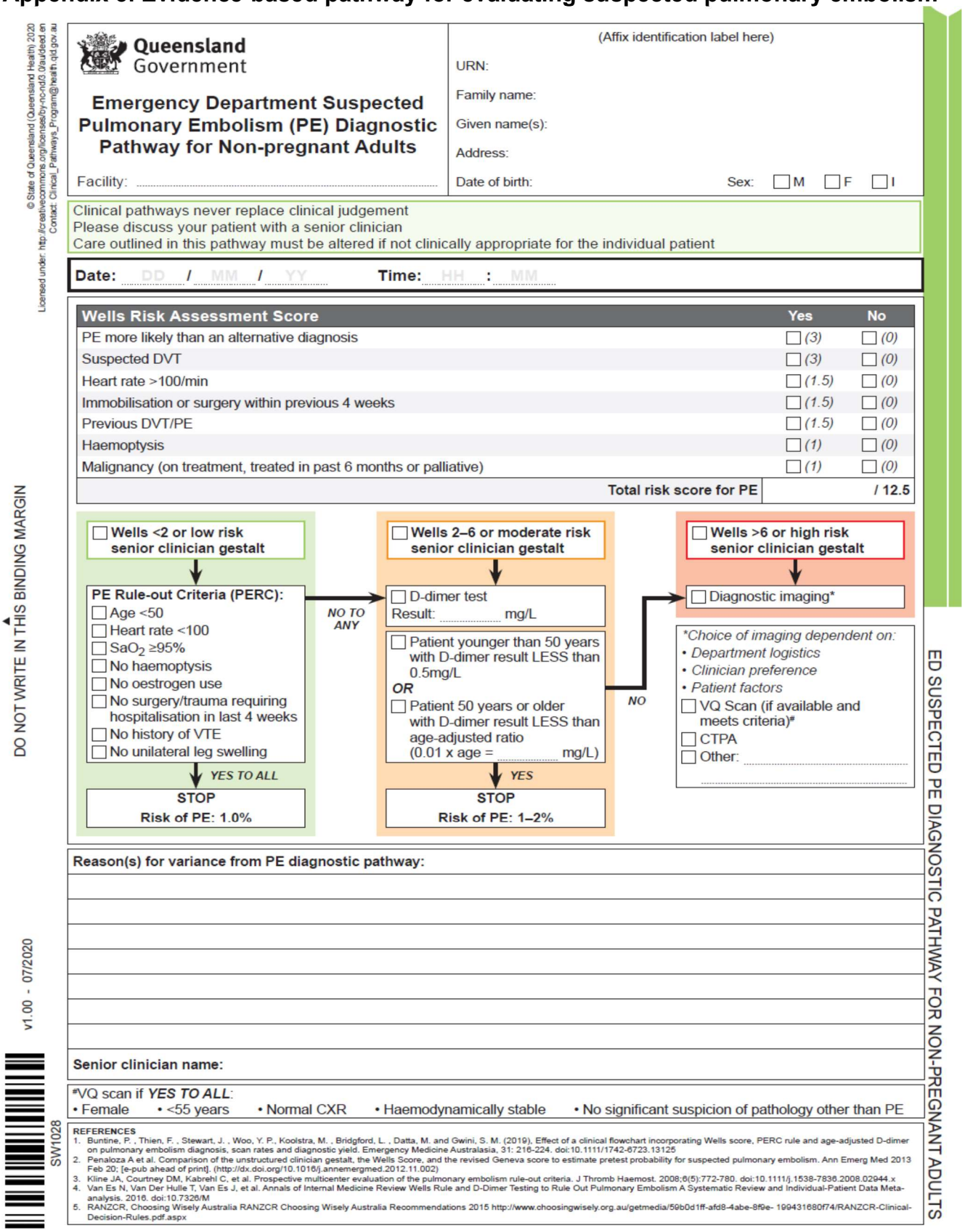
Non-sustained ventricular tachycardia

- >3 consecutive beats and <30 s

Post-cardiac arrest

*Adapted from Sandau et al. Circulation 2017;136:e273–344.

Appendix 5. Evidence-based pathway for evaluating suspected pulmonary embolism



Queensland Government

Emergency Department Suspected Pulmonary Embolism (PE) Diagnostic Pathway for Non-pregnant Adults

Facility: .....

(Affix identification label here)

URN:

Family name:

Given name(s):

Address:

Date of birth: Sex: ☐ M ☐ F ☐ I

Clinical pathways never replace clinical judgement
Please discuss your patient with a senior clinician
Care outlined in this pathway must be altered if not clinically appropriate for the individual patient

Date: DD / MM / YY **Time:** HH : MM

Wells Risk Assessment Score	Yes	No
PE more likely than an alternative diagnosis	☐ (3)	☐ (0)
Suspected DVT	☐ (3)	☐ (0)
Heart rate >100/min	☐ (1.5)	☐ (0)
Immobilisation or surgery within previous 4 weeks	☐ (1.5)	☐ (0)
Previous DVT/PE	☐ (1.5)	☐ (0)
Haemoptysis	☐ (1)	☐ (0)
Malignancy (on treatment, treated in past 6 months or palliative)	☐ (1)	☐ (0)
Total risk score for PE		**/ 12.5**

☐ **Wells <2 or low risk senior clinician gestalt**

PE Rule-out Criteria (PERC):
- ☐ Age <50
- ☐ Heart rate <100
- ☐ SaO_2 ≥95%
- ☐ No haemoptysis
- ☐ No oestrogen use
- ☐ No surgery/trauma requiring hospitalisation in last 4 weeks
- ☐ No history of VTE
- ☐ No unilateral leg swelling

YES TO ALL

STOP
Risk of PE: 1.0%

NO TO ANY

☐ **Wells 2–6 or moderate risk senior clinician gestalt**

☐ D-dimer test
Result: ..... mg/L

☐ Patient younger than 50 years with D-dimer result LESS than 0.5mg/L
OR
☐ Patient 50 years or older with D-dimer result LESS than age-adjusted ratio (0.01 x age = ... mg/L)

YES

STOP
Risk of PE: 1–2%

NO

☐ **Wells >6 or high risk senior clinician gestalt**

☐ Diagnostic imaging*

**Choice of imaging dependent on:*
- *Department logistics*
- *Clinician preference*
- *Patient factors*

☐ VQ Scan (if available and meets criteria)#
☐ CTPA
☐ Other: .....

Reason(s) for variance from PE diagnostic pathway:

Senior clinician name:

#VQ scan if ***YES TO ALL***:
• Female • <55 years • Normal CXR • Haemodynamically stable • No significant suspicion of pathology other than PE

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1. Buntine, P. , Thien, F. , Stewart, J. , Woo, Y. P., Koolstra, M. , Bridgford, L. , Datta, M. and Gwini, S. M. (2019), Effect of a clinical flowchart incorporating Wells score, PERC rule and age-adjusted D-dimer on pulmonary embolism diagnosis, scan rates and diagnostic yield. Emergency Medicine Australasia, 31: 216-224. doi:10.1111/1742-6723.13125
2. Penaloza A et al. Comparison of the unstructured clinician gestalt, the Wells Score, and the revised Geneva score to estimate pretest probability for suspected pulmonary embolism. Ann Emerg Med 2013 Feb 20; [e-pub ahead of print]. (http://dx.doi.org/10.1016/j.annemergmed.2012.11.002)
3. Kline JA, Courtney DM, Kabrehl C, et al. Prospective multicenter evaluation of the pulmonary embolism rule-out criteria. J Thromb Haemost. 2008;6(5):772-780. doi:10.1111/j.1538-7836.2008.02944.x
4. Van Es N, Van Der Hulle T, Van Es J, et al. Annals of Internal Medicine Review Wells Rule and D-Dimer Testing to Rule Out Pulmonary Embolism A Systematic Review and Individual-Patient Data Meta-analysis. 2016. doi:10.7326/M
5. RANZCR, Choosing Wisely Australia RANZCR Choosing Wisely Australia Recommendations 2015 http://www.choosingwisely.org.au/getmedia/59b0d1ff-afd8-4abe-8f9e- 199431680f74/RANZCR-Clinical-Decision-Rules.pdf.aspx

DO NOT WRITE IN THIS BINDING MARGIN

ED SUSPECTED PE DIAGNOSTIC PATHWAY FOR NON-PREGNANT ADULTS

v1.00 - 07/2020

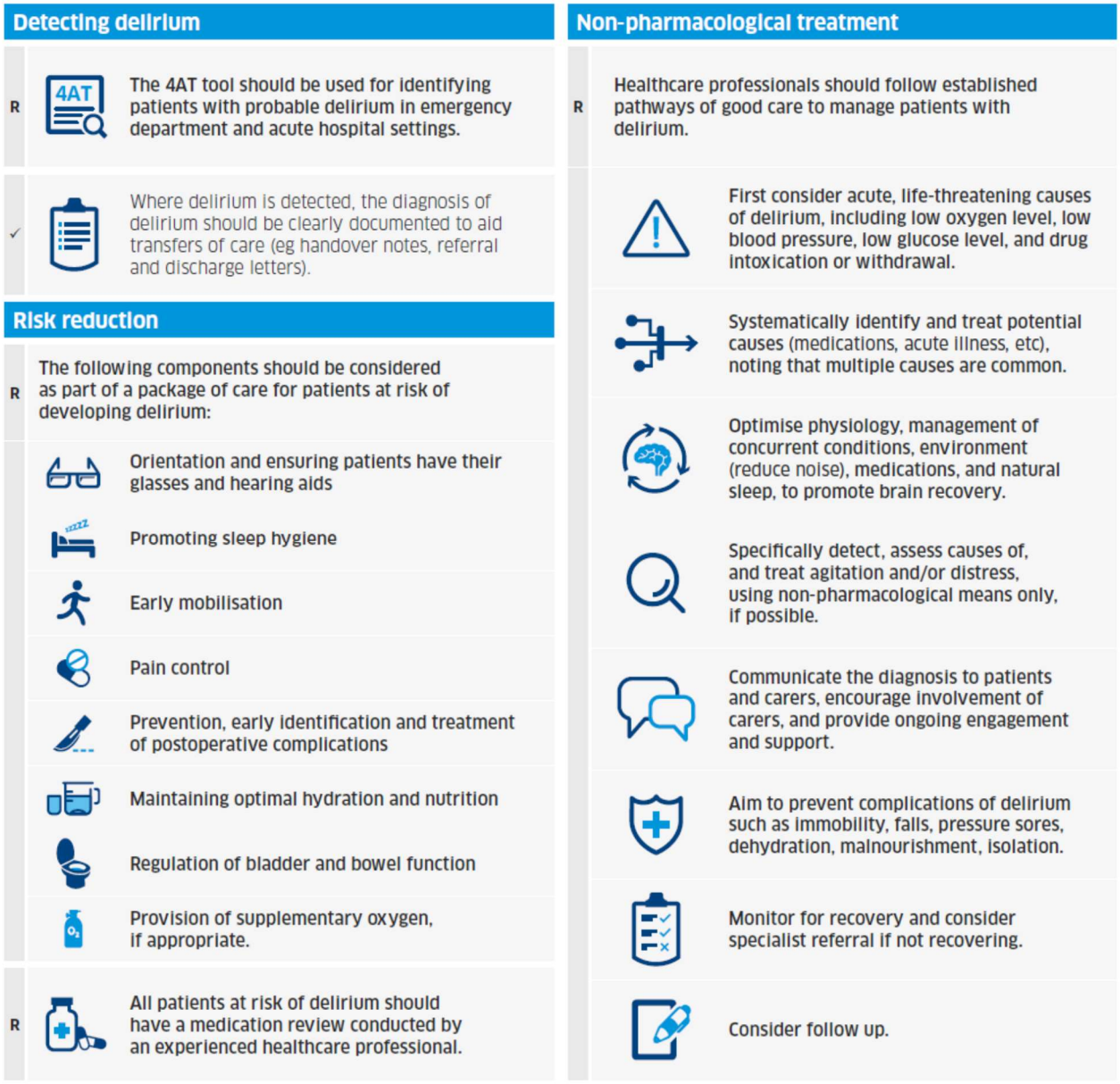
SW1028

Appendix 6. The CEASE deprescribing protocol*

Key step	Detailed processes
1. **C**urrent medicines to be ascertained	
2. **E**levated risk - consider potential for this patient to be harmed by the medicines being prescribed	By design this applies to our patients – 65 and over on 8 or more medications
3. **A**ssess each medicine by comparing intended benefit with potential harm *Should we consider stopping drug X?* **Must choose at least one option for each medication ceased**	• When there is no valid indication or indication can not be confirmed; • When the medicine is part of a prescribing cascade – used to treat the symptom of another medication • When actual or potential harm of a medicine clearly outweighs any potential benefit • When a symptom control medicine is: A) having no effect on persistent symptoms/loss of function/poor quality of life OR B) symptoms have completely resolved • When a preventive medicine is very unlikely to confer any patient-important benefit over the patient's remaining lifespan • When medicines are imposing unacceptable treatment burden
4. **S**ort - prioritise medicines for discontinuation *In what order should I stop medicines X, Y, Z?*	• High risk or actual harm • Low benefit • Others
5. **E**liminate **-** implement and monitor medicine discontinuation regimen *How can I safely and effectively stop medicine X?* *What should I watch out for as I stop medicine X?*	• Explain management plan to the patient and ensure agreement • Formulate a plan for weaning a medicine (as appropriate) and monitor closely • Instruct patient (or carer) on what to look for and report in the event of withdrawal syndromes or disease relapse • Communicate plan to all health professionals and other relevant parties (carers, family) involved in patient's care • Fully document the reasons for, and outcomes of, deprescribing and organise follow up.

* Scott et al. JAMA Intern Med 2015; 175: 827–834.

Appendix 7. Approach to detection and management of delirium*



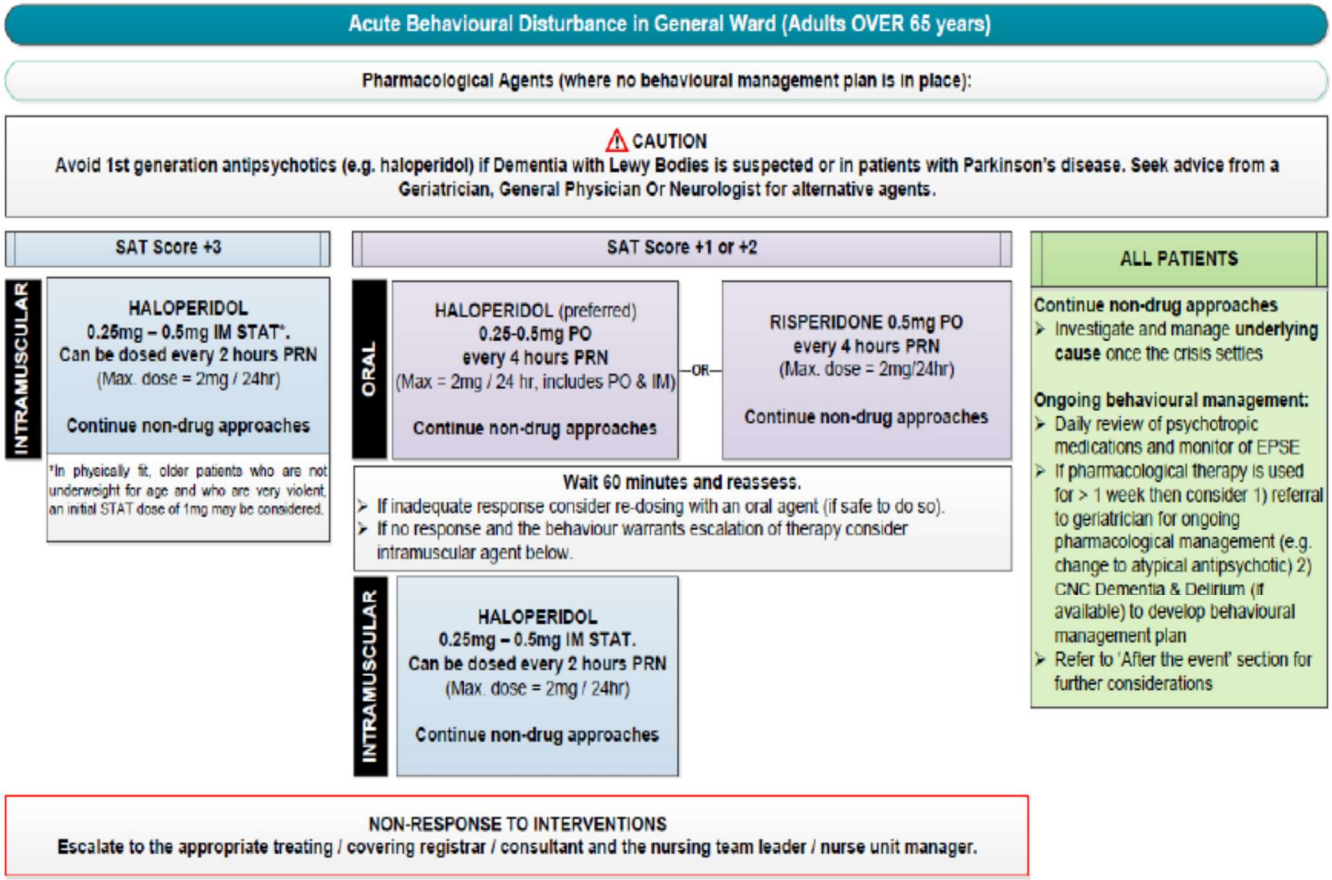
*Scottish Intercollegiate Guidelines Network 157: Risk reduction and management of delirium. https://www.sign.ac.uk/sign-157-delirium.html

Appendix 8. Pharmacological management of acute behavioural disturbance

Sedation Assessment Tool*

Responsiveness	Speech	Score
Combative, violent, out of control	Continual loud outbursts, physical aggression	+3
Very anxious and agitated	Loud outbursts	+2
Anxious/restless	Normal/talkative	+1
Awake and calm/cooperative	Speaks normally	0
Asleep but rouses if name is called	Slurring or prominent slowing	-1
Responds to physical stimulation	Few recognisable words	-2
No response to stimulation	None	-3

***** Inouye et al. Lancet Psychiatry 2014; 1(4): 312-315.



Metro South Acute behavioural disturbance management procedure of confused older persons > 65 years.

Additional resources pertaining to the pharmacological management of delirium and behavioural symptoms in patients with cognitive impairment can be found at:
https://qheps.health.qld.gov.au/caru/networks/cognitive-impairment-toolkit/delirium/pharmacological

Appendix 9. Cellulitis pathway

Class I
1. No systemic symptoms/ signs
   AND
2. No significant comorbidity that requires stabilisation or that may complicate resolution of infection

Class II
1. Mild-moderate systemic symptoms/signs
   OR
2. Otherwise stable comorbidity that may complicate resolution of infection
   OR
3. Not responding to appropriate oral therapy after 48 hours*

Class III
1. Significant systemic symptoms/ signs
   (eg hypotension, tachycardia, T≥39°C, tachypnoea
   OR
2. Unstable comorbidities
   (e.g. poorly controlled diabetes, severe peripheral vascular disease, immunosuppression)
   OR
3. Limb threatening infection

Class IV
1. Severe systemic symptoms/ signs
   OR
2. Necrotising fasciitis

Consider for antibiotic therapy via HITH
See Step 3

Outpatient management with oral antibiotics

Investigations
- Swab purulent discharge (if present)*
- Other investigations (as indicated)

Antibiotics
- Dicloxacillin 500mg PO 6-hourly for 5 days
- If mild penicillin hypersensitivity:
  Cefalexin 500mg PO 6-hourly for 5 days
- If immediate penicillin/ beta-lactam hypersensitivity or MRSA:
  Clindamycin 450mg PO 8-hourly for 5 days
  (300mg if < 60kg)

Provide patient information brochure, stress strict limb elevation (see diagram) and inform patient leg may be red and sore for some days
Advise patient to follow up with GP within 48-72 hours (with discharge summary)

Admit for inpatient IV antibiotics

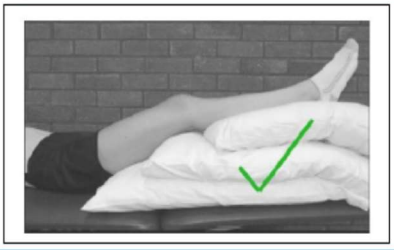
Investigations
- FBE, UEC, LFT, swab purulent discharge,* consider blood cultures if febrile*

Antibiotics
Moderate-severe cellulitis:
- Flucloxacillin 2g IV 6-hourly
- If mild penicillin hypersensitivity: Cefazolin 2g IV 8-hourly
- If immediate penicillin/ beta-lactam hypersensitivity or known MRSA colonisation/infection/risk factors*
  Lincomycin 600mg IV 8-hourly

For necrotising skin/soft tissue infections: See The Therapeutic Guidelines Antibiotic and consult ID – needs urgent surgical/ orthopaedic consultation for debridement

Refer patient for admission
- Ensure strict **limb elevation (see diagram)**

Cease IV antibiotics and discharge when patient has been afebrile for 24 hours



*See Practice Points
(turn over page)

Step 3. Assess suitability of patients with Class II cellulitis for outpatient antibiotic therapy via HITH		NO	YES
1	Is there orbital or facial cellulitis?		
2	Is there upper limb involvement?		
3	Is the cellulitis associated with a diabetic foot ulcer?		
4	Is it associated with exposure to water (e.g. sea, river, creek, lake)?		
5	Is the patient morbidly obese? (likely under-dosing of Cefazolin – call ID for advice)		
6	Is it associated with penetrating injury or animal or human bite?		
7	Is there necrosis or a requirement for surgical debridement?		
8	Is the cellulitis rapidly progressive or the tissue damage extensive?		
9	Is it associated with critical limb ischemia?		
10	Does the patient have significant renal dysfunction (e.g. eGFR<30 or concern over deteriorating renal function)?		
11	Is the patient significantly immunocompromised?		
12	Is the patient known to be colonised with MRSA?		
13	Is the patient taking medications that interact with probenecid (esp. methotrexate, also caution with sulphonylureas)? Or involved in competitive sport? (probenecid is a banned masking agent)		
14	Is the patient unable to care for themselves (or unable to receive appropriate supportive care)?		

If "YES" to any of the above, treat as an inpatient or consult ID for advice as to suitability for HITH on a case-by-case basis

If "NO" to all of the above

Antibiotics via HITH

Investigations

- FBE, UEC, LFT, CRP, others as indicated: swab purulent discharge*

Insert a PIVC using aseptic technique per hospital policy

Antibiotics

- Cefazolin 2g IV 24-hourly + Probenecid 1g PO 24-hourly
- OR, If immediate or severe penicillin or cephalosporin hypersensitivity or known to be MRSA colonised, use Lincomycin 1.8g/24h continuous infusion – for other IV antibiotics seek ID advice
- Recommended first IV dose be given in ED to ensure no immediate adverse reactions
- Change to oral antibiotics (step 2, class 1) after 24-48 hours if patient afebrile, well, falling WCC/CRP
- Total duration of antibiotics (IV + oral) should be no more than 5 days in most patients

Refer to HITH

- In hours: After hours:

Provide patient information brochure, ensure strict limb elevation (see diagram) and inform patient leg may be red and sore for some days

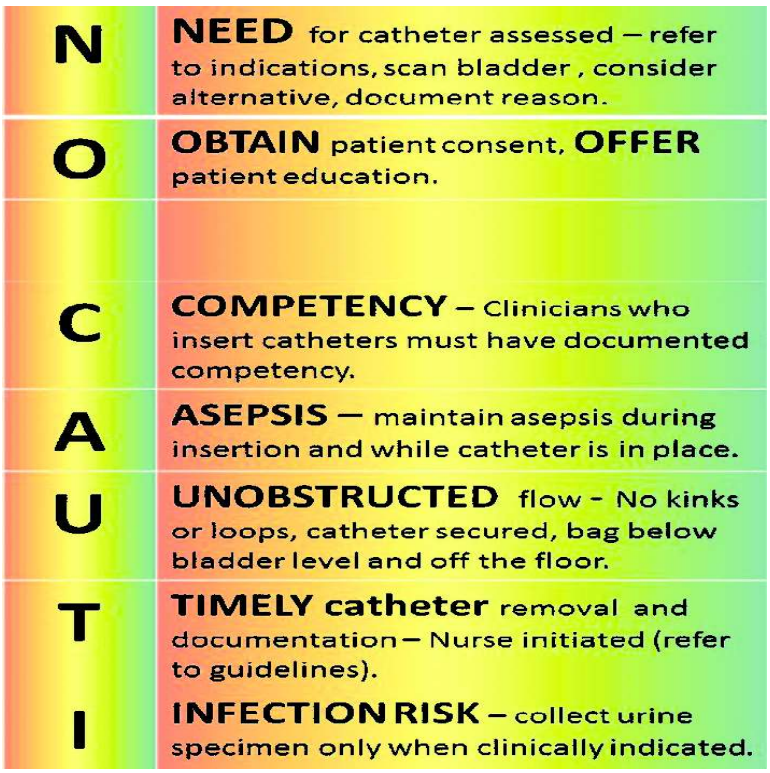
Practice points

- Misdiagnosis of cellulitis is common (up to 30%) so always consider alternative diagnoses, especially fully adherent patients not responding to appropriate oral antibiotics – consider dermatologist or ID review (telehealth if available)
- MRSA infection requires appropriate antibiotic ---- swab of purulent discharge is recommended. Risk factors comprise:
  - History of past MRSA infection/colonisation in patient or close contact
  - Recurrent skin boils or furuncles
  - History of incarceration or injected drug use
  - Indigenous populations, Pacific islanders
- Treat underlying conditions that predispose to cellulitis
  - Tinea pedis --- look for web fissuring between toes; treat with miconazole 2% ointment topically three times a day
  - Chronic leg oedema/lymphoedema ------ apply compression stockings if no contra-indication
  - Acute venous eczema ------ short course of topical steroid (e.g. betamethasone valerate 0.05%) may be required
  - Dry skin ------ use moisturising emollients (e.g. aqueous cream or sorbelene, or white soft paraffin if skin very dry)
  - Recurrent cellulitis despite above measures ---- consider prophylactic antibiotics with ID advice
- Persistent or enlarging erythema (reflecting post-infectious inflammation) in patient who is otherwise clinically improving does not signify treatment failure requiring switch to alternative antibiotics or ongoing IV antibiotics
- Open wounds or areas of desquamating skin require a dressing regimen to be established prior to discharge and regular dressing changes from local wound care service (general practitioner, Wound Care Australia, etc)
- Imaging is not required unless strong suspicion of complicating abscess, DVT, necrotising fasciitis
- Blood cultures are rarely positive and results rarely change management --- reserve for selected cases

Appendix 10. Indwelling urinary catheter insertion and management record

Prevention of Catheter Acquired Urinary Tract Infection and Trauma, Queensland Health THE FIVE STEPS URINARY CATHETER INSERTION AND MANAGEMENT RECORD						
MRN	Pt. Name			Consent given?	Yes	No
Reason for catheterisation						
Date of insertion	Date for change			Date of removal		
1. Right Catheter - route, size and length			Cath.Size FG	Male	Female	
2. Right Catheter type	2 way	3 way	Silicone	Latex	Other	
3. Use lubricant	Anaesthetic Lubricant Gel		1 tube	2 tubes	3 tubes	
4. Advance slowly, stop if resistance felt.			Difficulty on insertion?	Yes	No	
Describe difficulty and any bleeding						
5. ONE attempt then contact Urology Ward			Urology attended?	Yes	No	
Amount of H_2O in balloon	ml		Autonomic dysreflexia risk?	Yes	No	
Volume of urine drained	ml		Urine specimen obtained and sent for mcs?		Yes	No
Name and designation of Inserter Name and designation of assistant						

West Moreton Hospital and Health Service indwelling urinary catheter instruction



Giles et al Healthcare Infection 2015; 20: 62 –71.

Appendix 11. Public messaging for engaging patients in reducing LBC

Choosing Wisely Australia
An initiative of NPS MedicineWise

NPS MEDICINEWISE

5 QUESTIONS

TO ASK YOUR DOCTOR OR OTHER HEALTH CARE PROVIDER BEFORE YOU GET ANY TEST, TREATMENT OR PROCEDURE

Some tests, treatments and procedures provide little benefit. And in some cases, they may even cause harm.

Use the 5 questions to make sure you end up with the right amount of care — not too much and not too little.

1 **DO I REALLY NEED THIS TEST, TREATMENT OR PROCEDURE?** Tests may help you and your doctor or other health care provider determine the problem. Treatments, such as medicines, and procedures may help to treat it.

2 **WHAT ARE THE RISKS?** Will there be side effects to the test or treatment? What are the chances of getting results that aren't accurate? Could that lead to more testing, additional treatments or another procedure?

3 **ARE THERE SIMPLER, SAFER OPTIONS?** Ask if there are alternative options to treatment that could work. Lifestyle changes, such as eating healthier foods or exercising more, can be safe and effective options.

4 **WHAT HAPPENS IF I DON'T DO ANYTHING?** Ask if your condition might get worse — or better — if you don't have the test, treatment or procedure right away.

5 **WHAT ARE THE COSTS?** Costs can be financial, emotional or a cost of your time. Where there is a cost to the community, is the cost reasonable or is there a cheaper alternative?

Appendix 12. A generic approach to reducing LBC*

Preparing for change

- What is the low benefit practice we (the clinical improvement team) want to address, and why?
- What is our goal and by when are we hoping to achieve it?
- Who are the key personnel that need to participate in any project aimed at changing practice? What matters to them? What drives their behaviour?
- Who are the individuals who are predisposed to, and can help lead, change?
- How can we provide a safe environment in which people can express their views about change openly and constructively, increase common understanding, come to own the rationale for change?
- How will we determine whether we are achieving reduction in the targeted low benefit practice? What will be our process and outcome measures, and how will we collect and analyse such data?

Operationalising the change

- What might be possible strategies for changing behaviour? These should involve a literature or Google search, talking to other change leaders, subsequent group discussion to identify ideas that have been considered by others, and learning from them what they were able, or not able, to achieve, and why
- Do we already have an intervention(s) that everyone involved feels is (are) potentially feasible and acceptable to clinicians, and therefore worth progressing?
- Can we adapt change interventions that have proved successful elsewhere and that better fit with local context?
- Does the intervention emphasise enablement (making it easier for people to do the right thing) rather than rules and forcing functions (which people may resist)?
- What resources, support and incentives do we need to implement and test the intervention?
- How do we evaluate and refine the intervention over time in a manner that ensures all involved remain informed, engaged and listened to?
- How will we ensure that the intervention, if successful, becomes sustained as business as usual?

Strategies for securing wider and more committed clinician engagement in quality and safety improvement

- Present the primary need for change as a means of improving patient outcomes, not efficiency or costs
- Use case narratives and anecdotes in addition to quantitative data to personalise the need for change
- Emphasise common goals using shared language and avoid perceptions of tribalism
- Be careful in attributing low benefit care to just one specific group or individual (so called ‘bad apples’ approach) and avoid simplistic mechanistic explanations of why and how things happen
- Allow, listen to, validate and respond to healthy scepticism of proposed change, especially if safety concerns are being expressed
- Use strategies that allow clinicians to retain choice while encouraging them to change (nudge strategies)
- Avoid overambitious goals, technical jargon and excessive talk of transformation
- Alleviate any threats of proposed change to personal identity and dispel fears of hidden agendas
- Minimise over-reliance on particular individuals (lone heroes) as sole and continuing change leads
- Prevent a drive for perfection and paralysis by analysis becoming barriers to progressing the change
- Stay on message — maintain a consistent and coherent approach

*Adapted from Scott et al Med J Aust 2020

Appendix 13. List of useful resources for reducing LBC

Low benefit care recommendations

RACP Evolve Program
https://evolve.edu.au/

Choosing Wisely Australia recommendations
https://www.choosingwisely.org.au/recommendations

Clinical care standards

Australian Commission on Safety and Quality in Health Care Clinical care standards
https://www.safetyandquality.gov.au/standards/clinical-care-standards

Toolkits for reducing LBC

Choosing Wisely Hospital Implementation Toolkit
https://www.choosingwisely.org.au/implementation/choosing-wisely-implementation-toolkit

Choosing Wisely Patient and Public Engagement
https://www.choosingwisely.org.au/resources/consumers-and-carers/patient-and-public-engagement-in-choosing-wisely

Choosing Wisely Starting a Choosing Wisely conversation (for consumers)
https://www.choosingwisely.org.au/resources/consumers-and-carers/conversation-starter-kit

The Victoria Quality Council. A guide to using data for health care quality improvement
https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0006/273336/vqc-guide-to-using-data.pdf

The NSW Clinical Excellence Commission Quality improvement tools
http://www.cec.health.nsw.gov.au/quality-improvement/improvement-academy/quality-improvement-tools

The Institute for Healthcare Improvement Quality Improvement Essentials Toolkit
http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

Australian Commission in Safety and Quality in Health Care. National Safety and Quality Health Service Standards User Guide for the Review of Clinical Variation in Health. August 2020 Care
https://www.safetyandquality.gov.au/sites/default/files/2020-08/NSQHSS%20User%20Guide%20for%20the%20Review%20of%20Clinical%20Variation%20in%20Health%20Care.pdf
University of California, San Francisco, Center for Healthcare Value. Caring Wisely, San Francisco (CA): The Center
https://healthvalue.ucsf.edu/caringwisely%E2%84%A2

University of Texas Value Institute for Health and Care
https://valueinstitute.utexas.edu/