How Urine Tests Drive System-Wide Antibiotic Overuse

Dr. Jerome Leis, Clinician Lead, Using Antibiotics Wisely, Choosing Wisely Canada
Dr. Sid Feldman, Clinician Co-Lead, Long-Term Care, Choosing Wisely Canada
Dr. Katrina Piggott, Physician, Geriatric Medicine, Sunnybrook Health Sciences Centre

Presenter Disclosure

- **Presenter:** Dr. Jerome Leis

- **Relationships with financial sponsors:**
  - **Any direct financial relationships including receipt of honoraria:** Support from Choosing Wisely Canada for work related to *Using Antibiotics Wisely*
  - **Memberships on advisory boards or speakers' bureau:** None
  - **Patents for drugs or devices:** None
  - **Other:** salary support: Sunnybrook Health Sciences Centre and University of Toronto

Presenter Disclosure

- **Presenter:** Dr. Sid Feldman

- **Relationships with financial sponsors:**
  - **Any direct financial relationships including receipt of honoraria:** Ontario College of Family Physicians, McMaster University (re Ontario Osteoporosis Strategy), Choosing Wisely Canada
  - **Memberships on advisory boards or speakers' bureau:** Scientific Advisory Council Osteoporosis Canada (volunteer)
  - **Patents for drugs or devices:** None
  - **Other:** Salary Support: Baycrest, University of Toronto

Presenter Disclosure

- **Presenter:** Dr. Katrina Piggott

- **Relationships with financial sponsors:**
  - **Any direct financial relationships including receipt of honoraria:** McMaster University Quality Improvement Certificate Program, Choosing Wisely Hematology
  - **Memberships on advisory boards or speakers' bureau:** None
  - **Patents for drugs or devices:** None
  - **Other:** AFP Innovation Grant (Sunnybrook, Baycrest), Choosing Wisely QI Grant, Sunnybrook Patient Communication Grant

Learning Objectives

1. Describe how routine urine testing for suspected UTIs contributes to antibiotic overuse across different health care settings.

2. Identify standard approaches to diagnosing UTIs among residents of long-term care and older adults in the community.

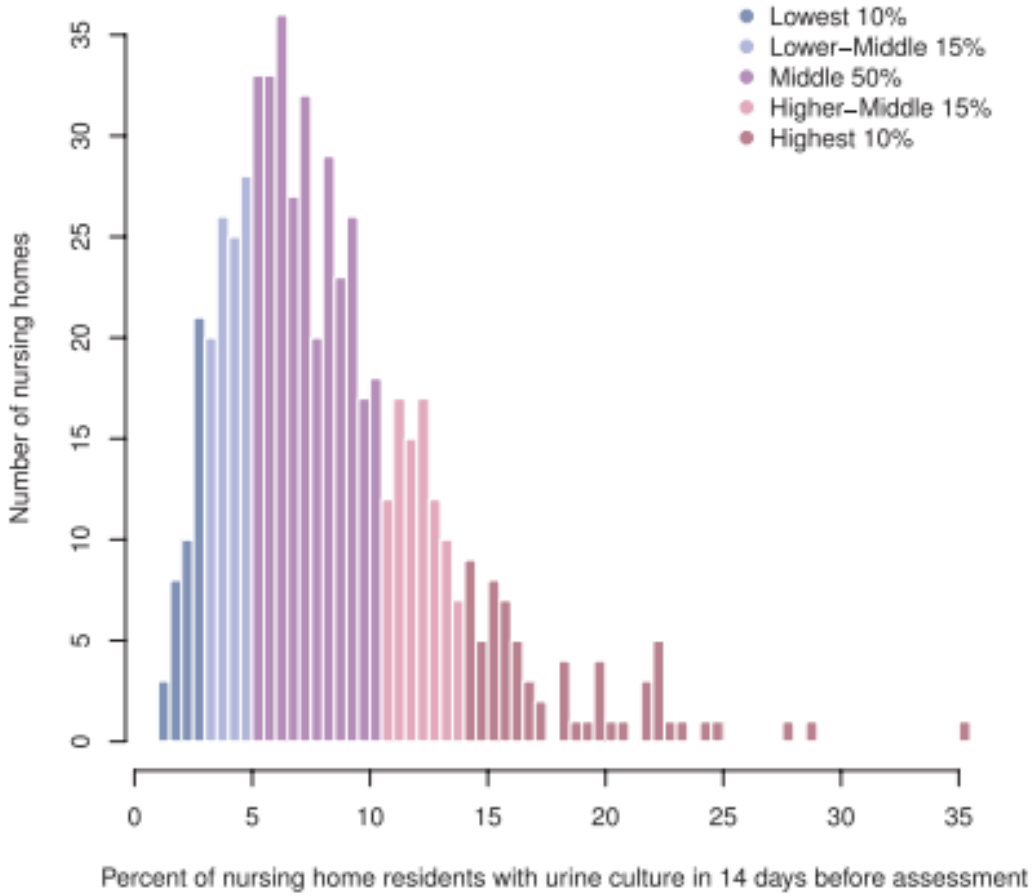
3. Identify practical strategies that can be applied to bring *consistency* regarding UTI diagnosis across hospitals, long-term, and primary care.

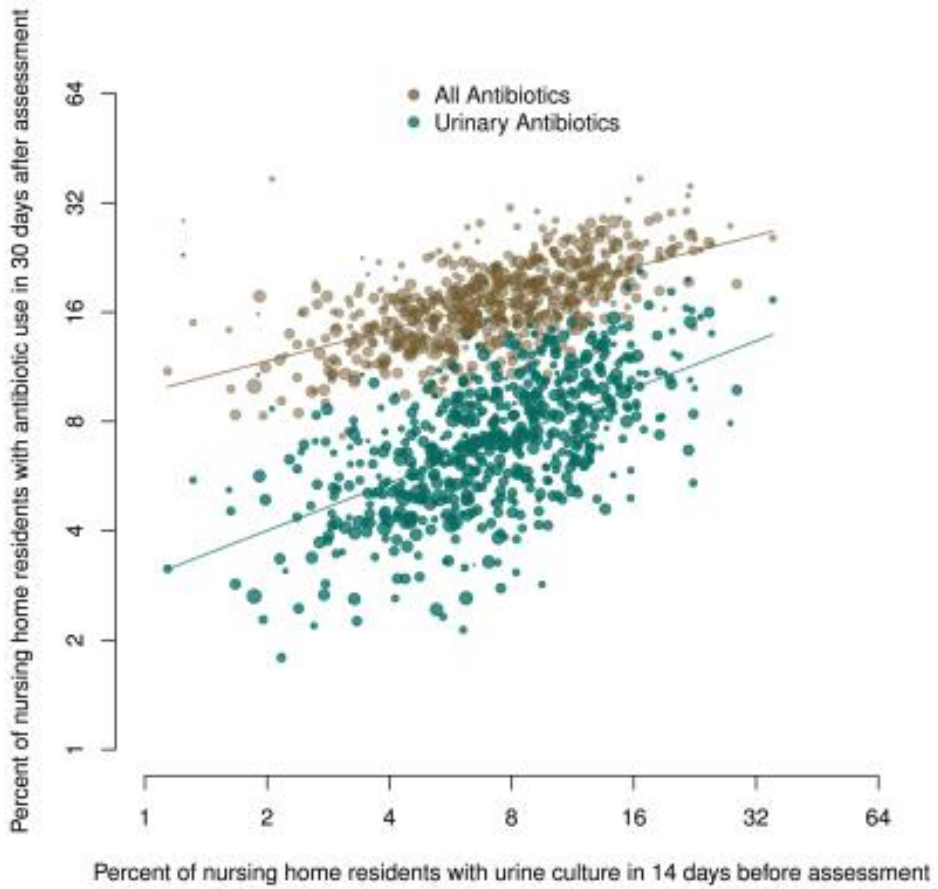
Overview

- Level setting
- Clinical challenges
- Quality improvement approaches

Level Setting

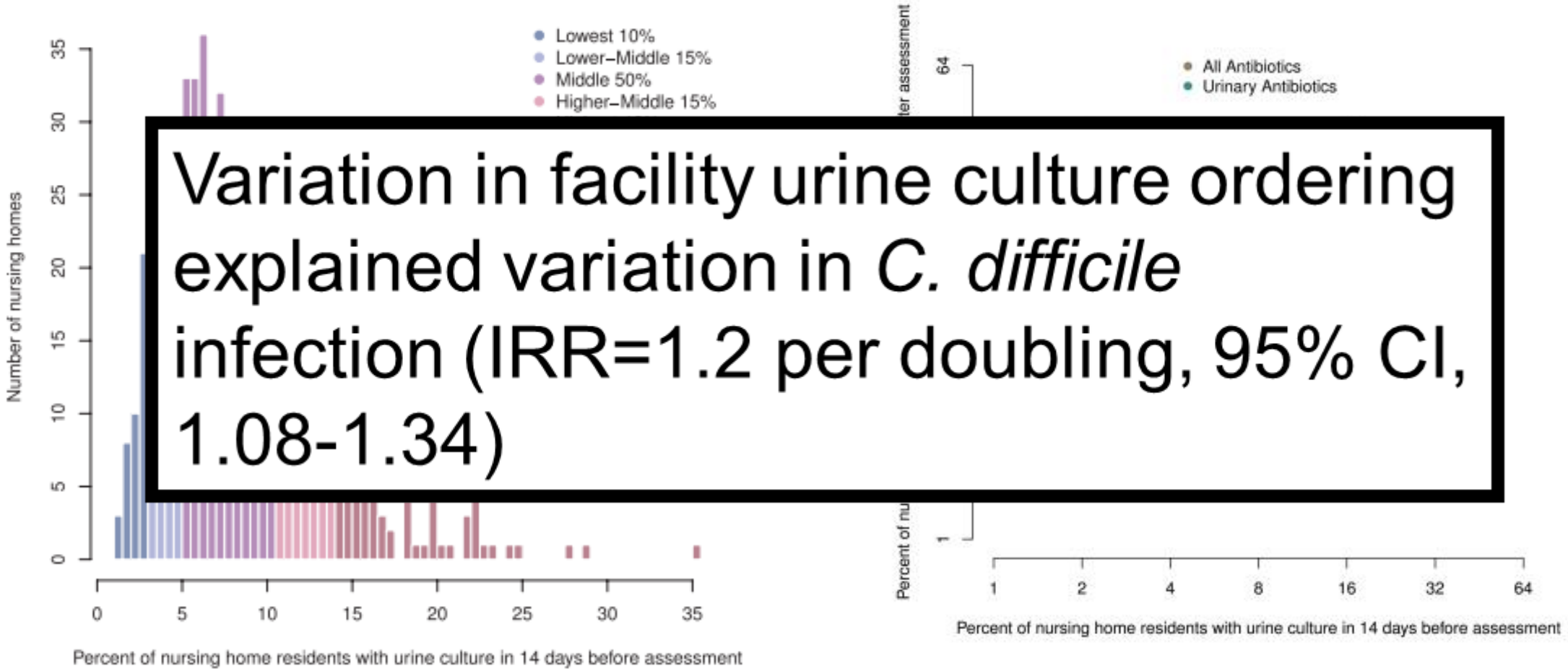
Variability across LTC sector





Brown KA et al, Clin Infect Dis. 2020

Variability across LTC sector



Variation in facility urine culture ordering explained variation in *C. difficile* infection (IRR=1.2 per doubling, 95% CI, 1.08-1.34)

Brown KA et al, Clin Infect Dis. 2020

Pathway for Low-value Care

A challenge across all healthcare sectors

	Overall		LTC		ED		Clinic		P-Value*
	n	%	n	%	n	%	n	%	
Inappropriate use across all Infection Types	359	48.8	304	47.5	16	47.1	39	63.9	0.048
Inappropriate for Lower Respiratory Tract Infections	99	50.7	94	51.9	2	28.6	3	42.9	0.437
Inappropriate for Skin and Soft Tissue Infections	47	26.9	29	21.5	3	25.0	15	53.6	0.002
Inappropriate for Urinary Tract Infections	213	58.4	181	55.9	11	73.3	21	80.8	0.023

Pulia et al, ARIC, 2018

Re-calibrating Potential Harms of Urine Testing

- Missed/incorrect diagnosis (diagnostic closure)
- Antibiotic adverse effects
- Antibiotic resistance
- Increased infection risk (altered microbiome)

- Delay in recognition of cystitis
- Potential amelioration of symptoms

Why Urinalysis is NOT Recommended for Diagnosis of UTI in Older Adults

Age	Prevalence of bacteriuria (%) (10^5 CFU/mL)	Pyuria PPV (5–10 leukocytes per hpf)	Pyuria NPV (5–10 leukocytes per hpf)
Age<65 in community	5	60-80	98-100
Age>65 in community	10-20	50-70	70-95
Man in LTC	35-50	40-60	70-90
Woman in LTC	50-80	20-40	75-90

Nicolle et al, IDSA guidelines for diagnosis and treatment of ASB, Clin Infect Dis, 2019
Advani et al, Performance of Urinalysis Parameters in Predicting Urinary Tract Infection Clin Infect Dis, 2024

Beveridge LA, Davey PG, Phillips G, McMurdo ME. Optimal management of urinary tract infections in older people. Clin Interv Aging. 2011;6:173-80.
den Heijer CD, van Dongen MC, Donker GA, Stobberingh EE. Diagnostic approach to urinary tract infections in male general practice patients: a national surveillance study. Br J Gen Pract. 2012
Juthani-Mehta, Manisha et al. "Diagnostic accuracy of criteria for urinary tract infection in a cohort of nursing home residents." *Journal of the American Geriatrics Society* vol. 55,7 (2007)

What is the Threshold for Ordering Urine Culture in a LTC Resident?

Minimum Loeb Criteria

For Residents WITH an Indwelling Urinary Catheter

- A patient must present with at least one of the following symptoms:
  - Fever (>37.9ºC /100ºF OR a 1.5ºC / 2.4ºF increase above baseline on at least two occasions)
  - New or worsening costovertebral angle (flank) tenderness
  - Rigors (shaking chills)
  - New onset of delirium

For Residents WITHOUT a Urinary Catheter

- A patient must present with either acute dysuria **OR** a combination of fever and at least two localizing urinary symptoms:
- **Option 1 (Dysuria):** Acute dysuria alone
- **Option 2 (Fever + Two Symptoms):** Fever (>37.9ºC /100ºF OR a 1.5ºC / 2.4ºF rise from baseline) **plus** at least two of the following:
  - New or worsening urgency to urinate
  - New or increased frequency in urination
  - New or increased suprapubic pain
  - Costovertebral angle tenderness
  - Obvious blood in urine
  - New or worsened urinary incontinence

Loeb et al, BMJ, 2005

Joint Statement on Dipstick Use in LTC

Antibiotics are overused in long-term care. Overdiagnosis of UTI is one of the most common reasons for unnecessary use of antibiotics in older populations. **Using urine dipsticks leads to inappropriate use of antibiotics.**
We believe that urine dipsticks should NOT be performed in residents of long-term care or any adult older than 65.

Therefore, we support the following recommendations:

- Do NOT purchase, store, or use urine dipsticks in long-term care homes.
- Do NOT perform urine dipstick in adults > 65 years old who present to a clinic, an Emergency Department or any other healthcare setting.

Note: routine and microscopic urine evaluation should be used for non-infectious indications only (e.g. to rule out hematuria, proteinuria).

Joint Statement on Dipstick Use in LTC

College of Family Physicians of Canada	Endorsed
Canadian Society for Long-Term Care Medicine	Endorsed
Canadian Nurses Association	Endorsed
Canadian Pharmacist Association	Endorsed
Nurse Practitioner Association of Canada	Endorsed
Association of Medical Microbiology and Infectious Disease Canada	Endorsed
Canadian Urological Association	Endorsed
Canadian Geriatrics Society	Endorsed
Canadian Association for Long Term Care	Endorsed
Health Standards Organization (HSO)	Endorsed

Baseline Data Collection

Three surveys administered across Nova Scotia, Ontario, Alberta, and Manitoba.

Goal: Capture baseline data on urine dipstick and urinalysis practices — how often, why, how, and what happens next (antibiotic use).

Output: Use findings to pilot a project improving how LTC homes administer urine testing appropriately.

3
surveys combined

88
LTC homes

4
provinces

Methods

Three surveys (survey monkey)

1

Facility Leadership i.e. Facility Directors, Nursing Leads, etc.

Nova Scotia LTC Homes

4 questions

Survey completed *month* 2024

2

Facility Leadership i.e. Facility Directors, Nursing Leads, etc.

Ontario LTC Homes (public homes)

7 questions

Survey completed *month* 2026

3

Facility Leadership i.e. Facility Directors, Nursing Leads, etc.

Ontario, Alberta & Manitoba LTC Homes (private homes)

7 questions

Survey completed *month* 2026

**Combined data for anonymity

At a Glance…

13.6%

routinely purchase dipsticks

n=12 of 88

17.0%

staff use dipsticks for residents

n=15 of 88

95.1%

Sent for urinalysis when no dipstick available

n=58 of 61

75.0%

have a formal testing policy

n=45 of 60

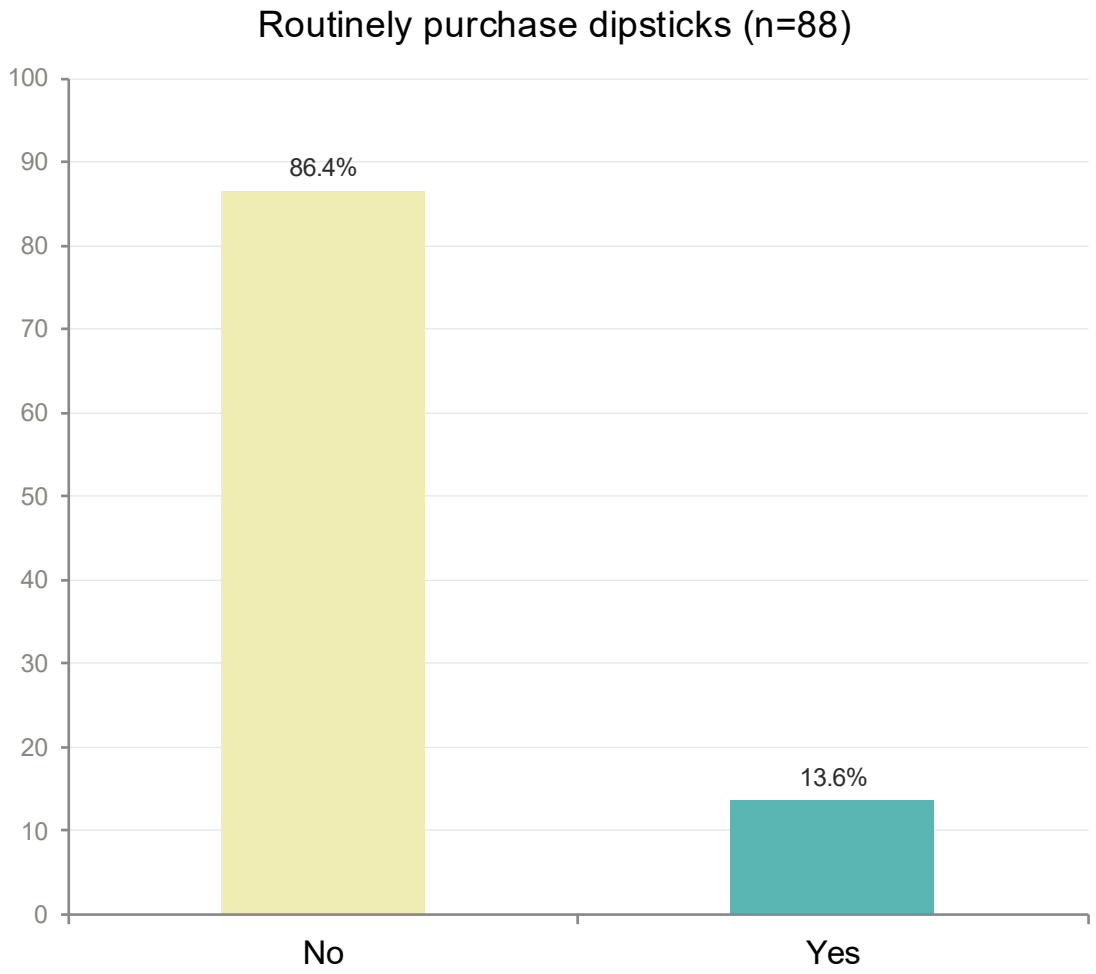
70.4%

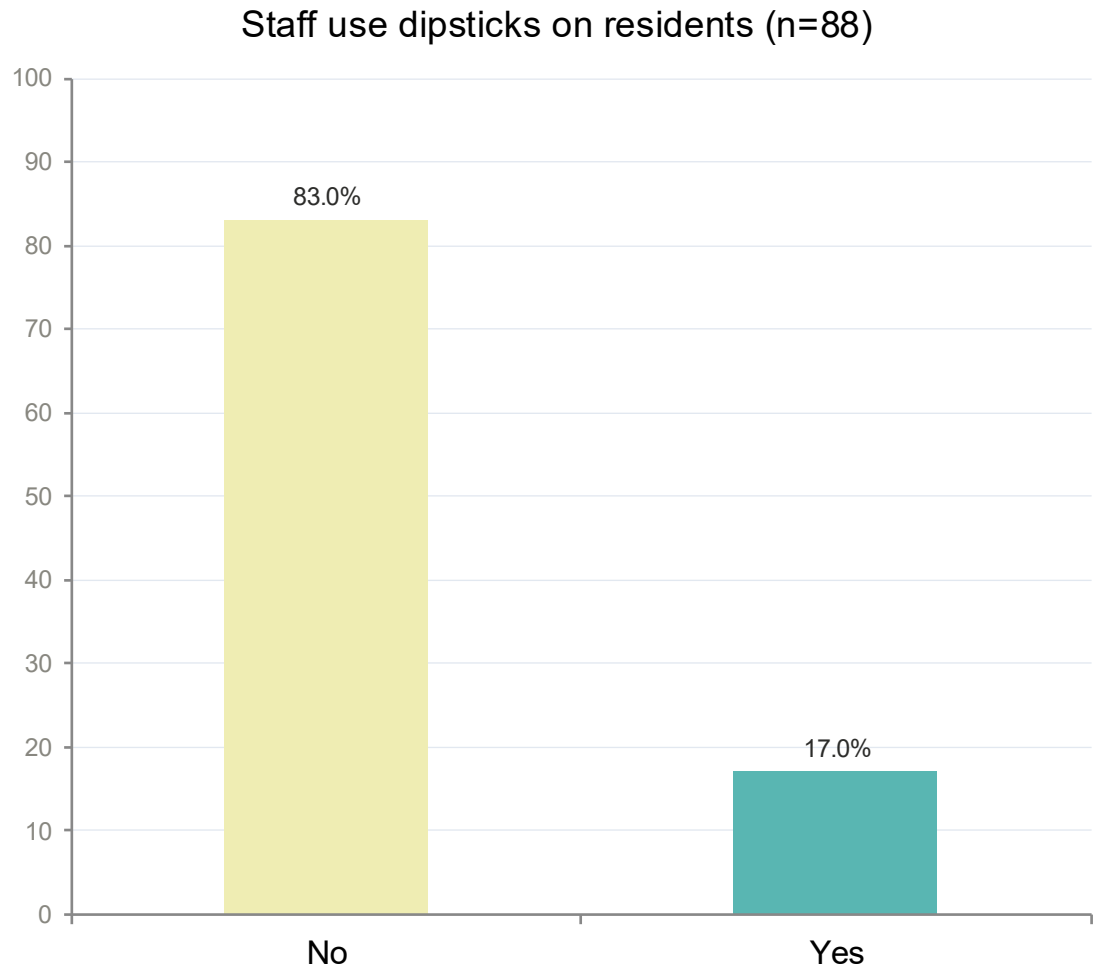
report caregiver pressure to test at least sometimes

n=19 of 27

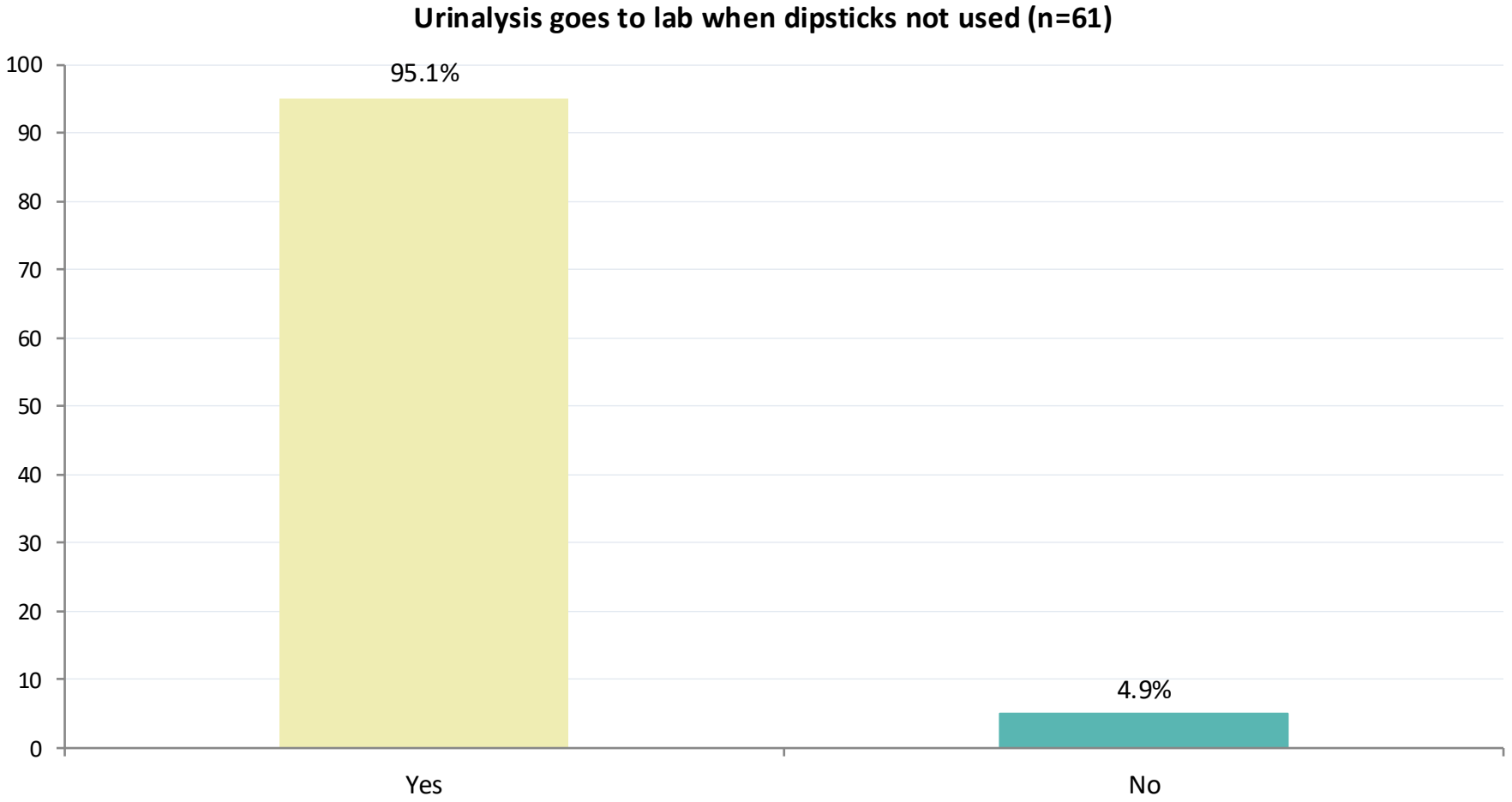
All results pooled — no individual home identified

Dipstick Use Is Low Across Canadian LTC Homes



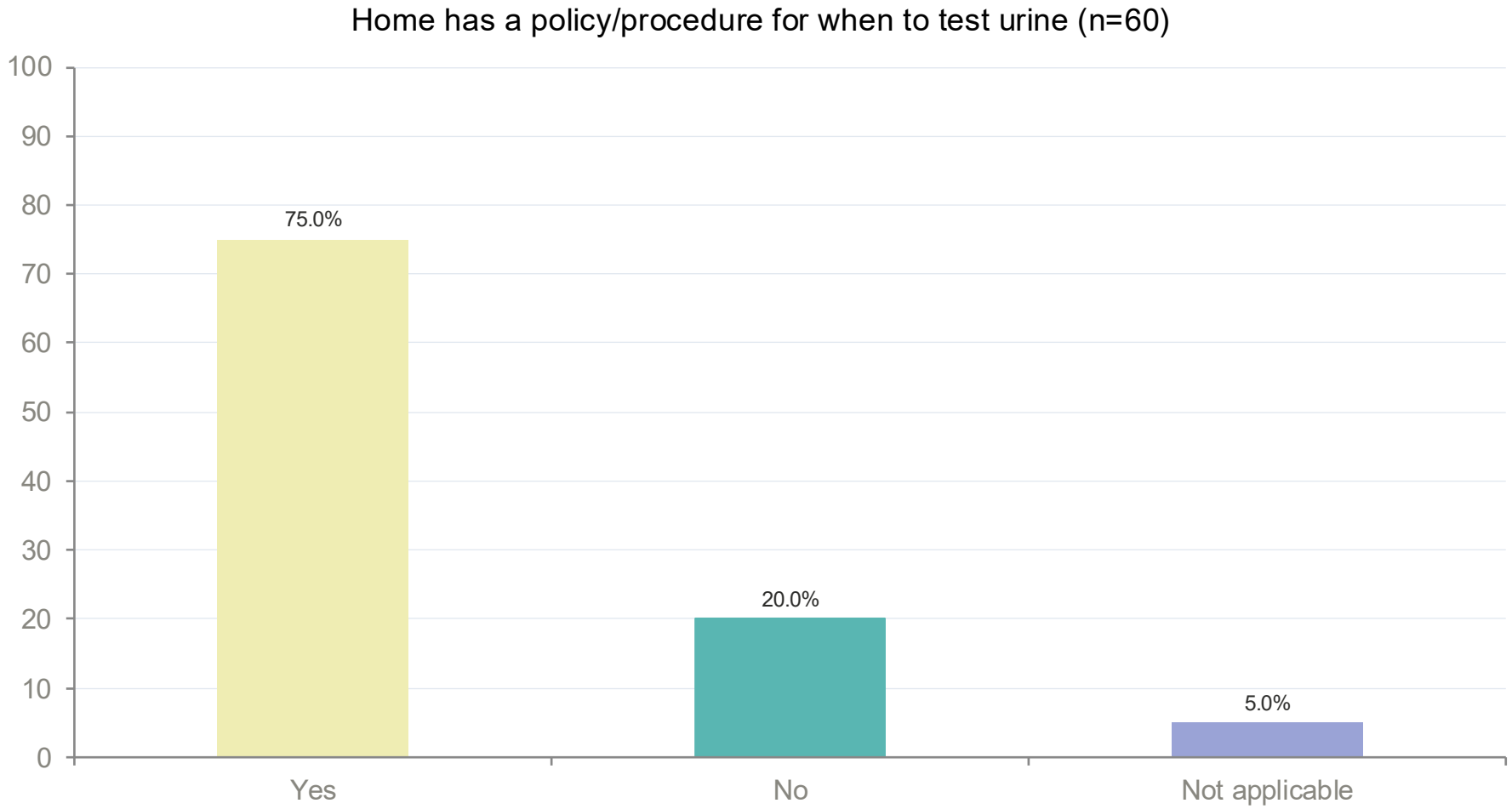


When Dipsticks Aren't Used, Urine Goes to the Lab



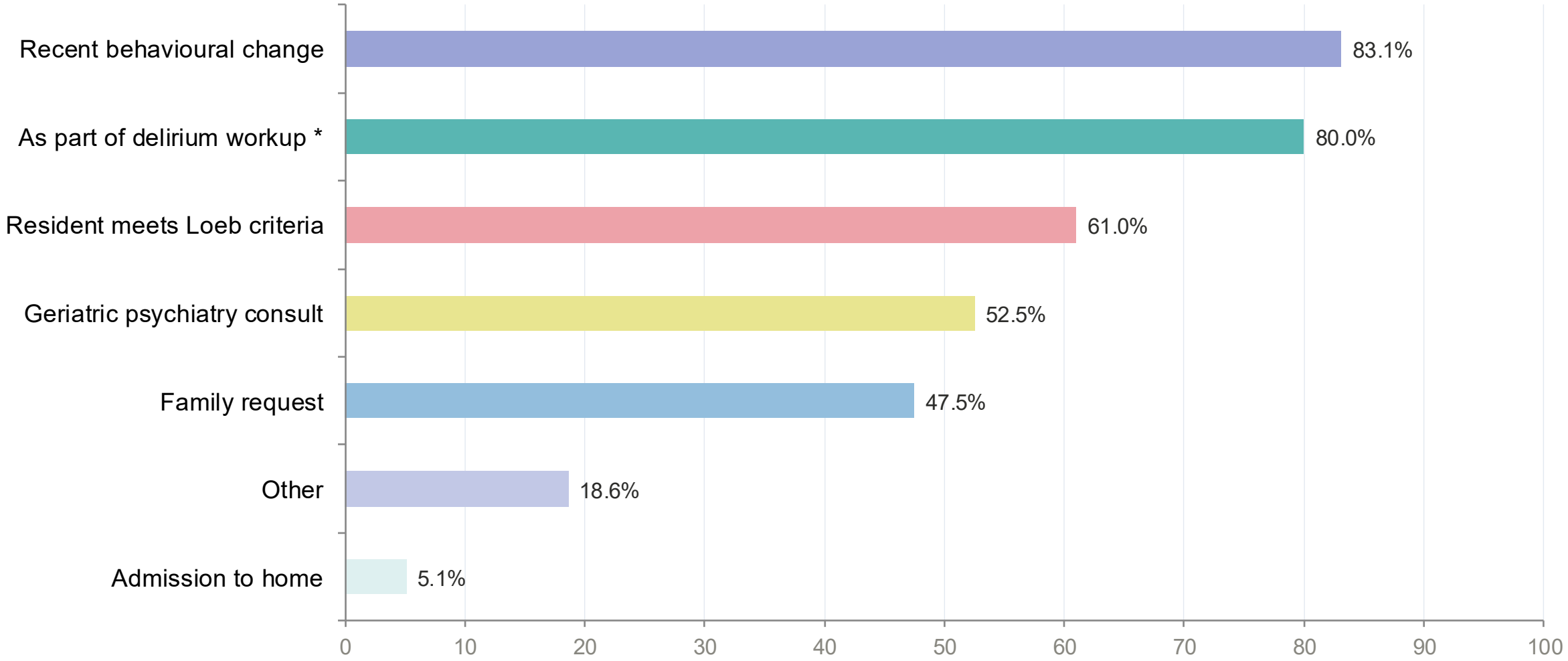
95.1% of homes rely on lab-based urinalysis as their primary testing method

Three-Quarters of Homes Have a Formal Testing Policy



20% of homes reported having no formal policy in place

Most Common Triggers for Urine Testing



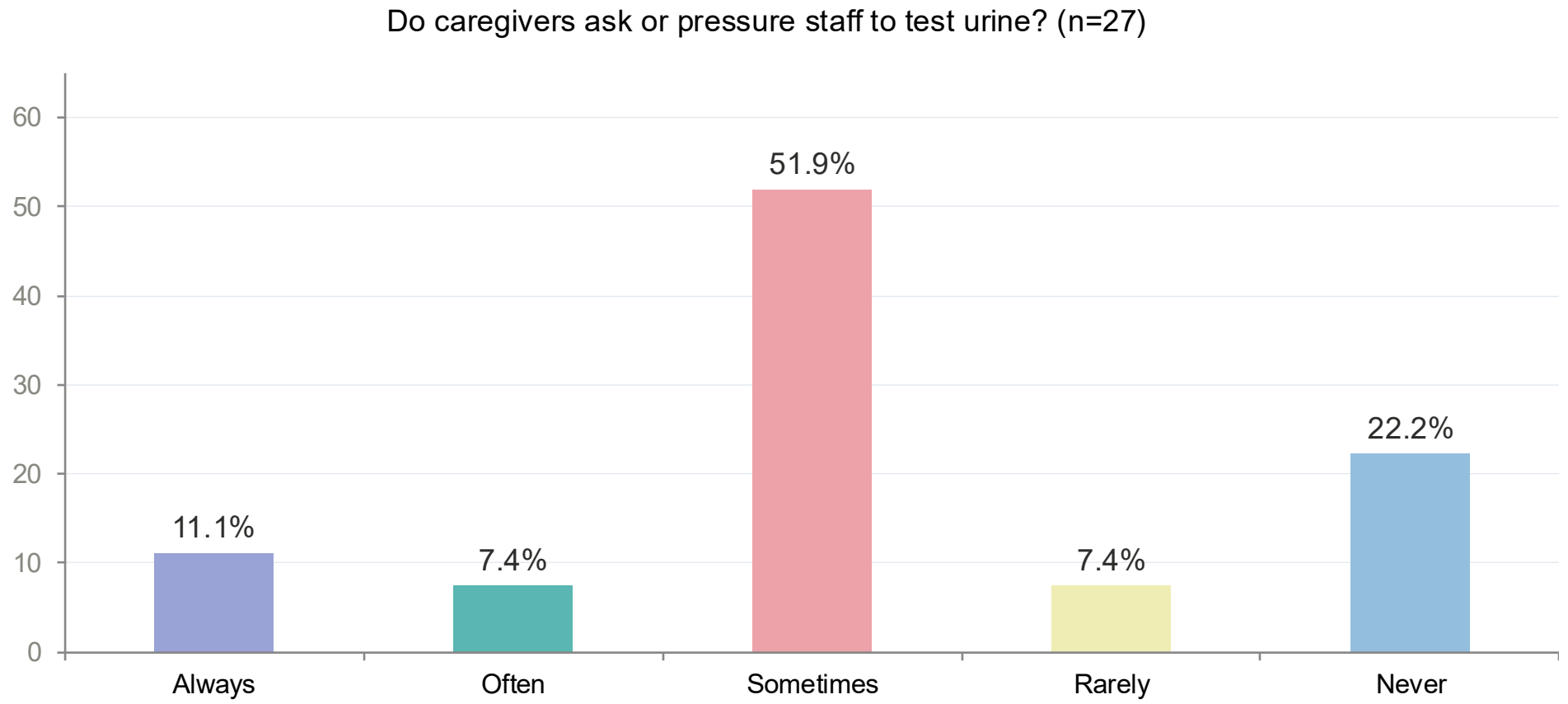
** 'Delirium workup' only in one survey (n=45); all others n=59*

Choosing Wisely Canada

“Other” Triggers Specified by Respondents

- Signs or symptoms of UTI (urgency, dysuria, burning on urination, foul-smelling urine)
- Change in condition, signs of dehydration, or change in catheter status
- Sudden deterioration in resident status, at physician’s discretion
- Consideration of three or more concurrent symptoms
- Physician order or physician assessment specifically requested
- Urine collected and sent to lab as directed in discussion with the physician

Caregiver Pressure to Test Is Common



70.4% of homes report caregiver pressure to test at least sometimes

Key Themes from Open-Ended Responses

6 themes identified from comments across all three surveys

Themes 1-3

1

Dipstick use largely discontinued

Phased out due to best practice guidelines or medical director decisions.
Some homes retain expired stock for occasional informal use.

“It was a decision by our previous Medical Director to not dip urines.”

2

Genuine interest in reintroducing dipsticks

Multiple homes expressed desire to bring dipsticks back — speed, convenience, and staff curiosity from acute care.

“Many of our part-time staff work in acute care and are curious why we don’t use them in LTC.”

3

Fluid-first before escalating to testing

Structured approach:
increase fluids 24–48 hrs first;
test only if symptoms persist or worsen.

“Initiating increased fluid intake in the first 24 hours is ideal; most of the time it will clear.”

Themes 4-6

4

Physician involvement gates testing

Testing requires physician direction, SBAR, or formal order - limiting ad hoc or caregiver-driven requests.

"The facility has a specific SBAR for suspected UTI that is to be completed and sent to the physician."

5

Some acknowledge over-testing

A subset of respondents reflected critically on their practices, acknowledging testing may exceed clinical indication.

"Sometimes I believe they test too much."

6

Call for national guidance

Respondents expressed desire for clear, country-wide standards. Current tools are inconsistent and locally developed.

"A clear country-wide guidance and policy would be lovely."

Clinical Challenges

Common clinical challenges

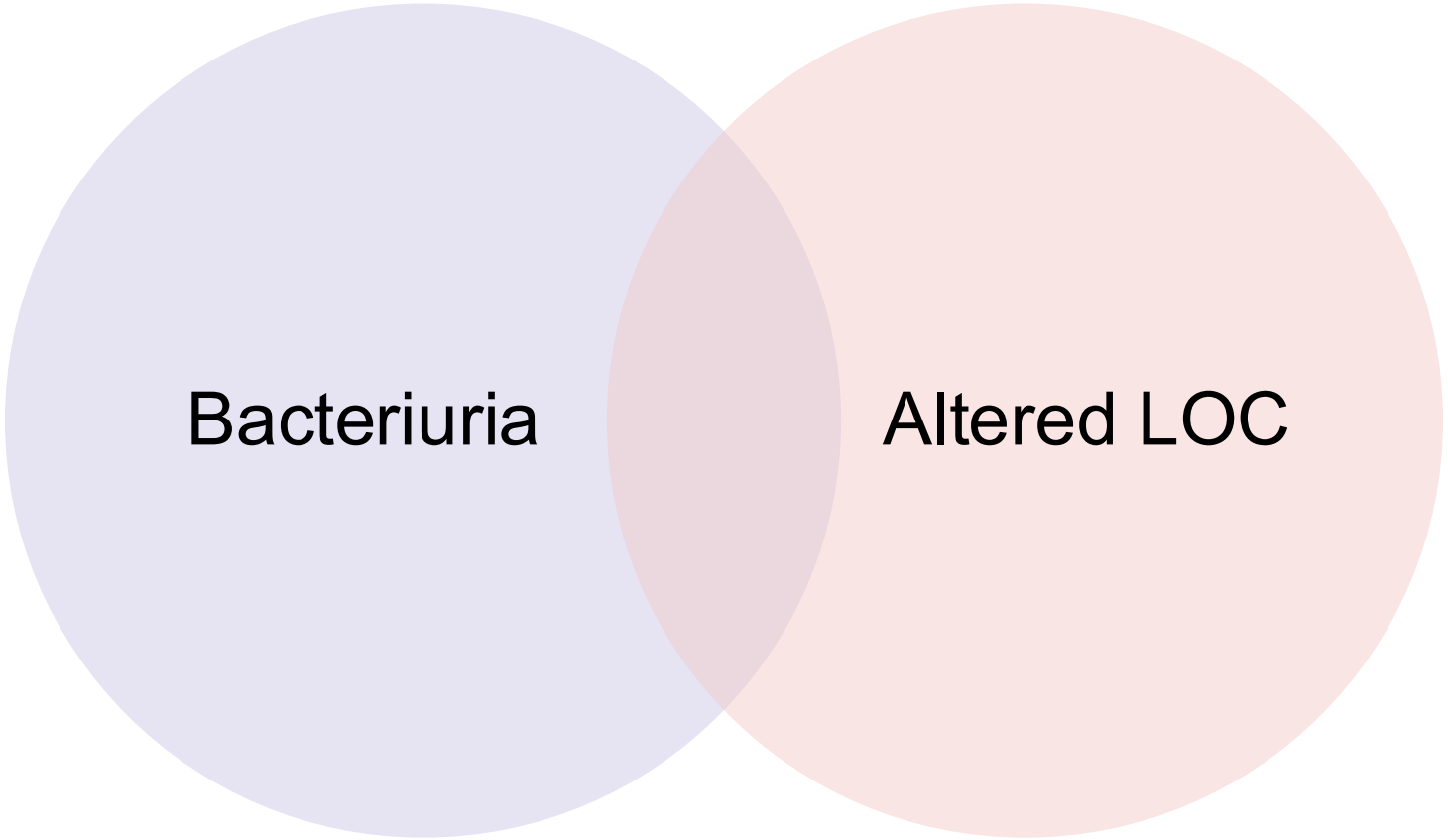
Delirium/advance dementia and bacteriuria

Antibiotics ‘to be safe’

Staff or caregiver expectation

Lack of alternate diagnosis

Delirium, Advanced Dementia & Bacteriuria: Understanding Common Host Factors



Delirium and Bacteriuria: What is the Evidence?

- Association between bacteriuria and delirium is host-related: no causal relationship established
- The exception is sepsis which presents with other signs (fever, changes to vital signs)
- Treatment of bacteriuria for non-sepsis related delirium does not improve mental status outcomes; Some evidence suggests worse functional outcomes (along with risk of C. difficile and other adverse reactions).
- International guidelines (eg. ISDA) recommend against urine culture for delirium alone - in absence of genitourinary symptoms or signs of systemic infection

Advanced Dementia and Bacteriuria

- These residents can provide limited history
  - Observational studies:
    - 16% of bacteriuric LTC residents with advanced dementia met minimum criteria for symptomatic UTI, yet 75% received antibiotics
  - Antimicrobial therapy confers no survival benefit, even when adjusted for functional status, temperature, or mental status change
  - Patients with advanced dementia in LTC treated for bacteriuria without meeting minimum diagnostic criteria have an 8.5-fold higher risk of *C. difficile* infection within 3 months of treatment

Rotjanapan P, Dosa D, Thomas KS. Potentially Inappropriate Treatment of Urinary Tract Infections in Two Rhode Island Nursing Homes. *Arch Intern Med.* 2011;171(5):438–443. doi:10.1001/archinternmed.2011.13

Urine Testing and Antibiotics to be Safe?

Loss of the protective role of asymptomatic bacteriuria

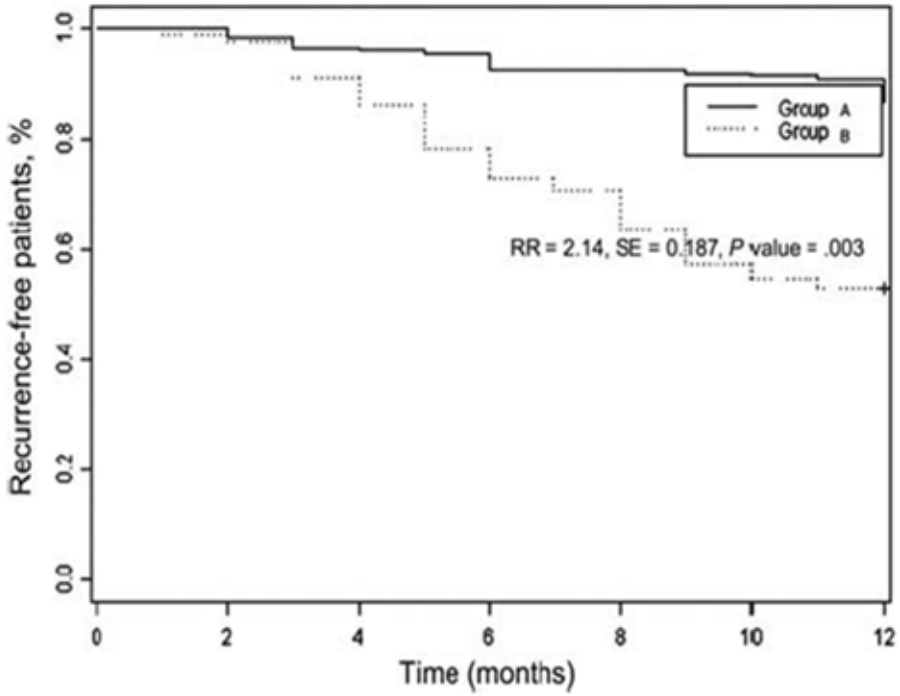


Figure 3. Kaplan-Meier curve analysis performed to calculate the probability of being recurrence-free between the 2 groups. Abbreviations: RR, relative risk; SE, standard error.

Group A not treated for ASB

Group B treated for ASB

Cai et al. The role of asymptomatic bacteriuria in young women with recurrent urinary tract infections: to treat or not to treat? Clin Infect Dis. 2012 Sep;55(6):771-7. doi: 10.1093/cid/cis534. Epub 2012 Jun 7. PMID: 22677710.

Case Examples

Case Presentation 1: Delirium

An older woman with moderate-stage dementia living in a long-term care home has new confusion and slurred speech.

Her nurse notes an “unusual urine smell” and collects a urine specimen for culture testing.

The care home physician is notified that afternoon of the clinical finding.

Approach 1

The care home physician performs a focused examination, which is unremarkable beyond the speech and mentation changes.

He signs off the urine culture order.

The urine culture returns with significant growth of Escherichia coli.

The woman is prescribed a course of antibiotics.

Approach 2

The care home physician performs a focused examination, which is unremarkable.

He declines to order the urine culture.

Instead, a regimented monitoring protocol is ordered including VS q4h, encouraging oral fluids, and arranges a CT head.

Approach 2 (Continued)

24 hours later, the resident develops low-grade fever, which is detected due to increased vital signs frequency.

They are examined in person by the on-call physician, who detects grimacing on palpation of the supra-pubic region.

A urine culture is ordered based on Modified Loeb criteria, and following speciation is started on appropriate urinary antimicrobials

Approach 2 (Continued)

24 hours later, neuroimaging reveals a new subacute small left MCA infarct, accounting for the aphasia previously noted.

The patient receives goal-directed secondary prevention (antiplatelet, statin) and is seen by SLP for her residual language changes as well as physiatry for mild right-sided arm weakness detected on physical exam.

Case Presentation 2: Pressure to Act

Weekend physician on call. Friday evening call:

83 y.o. LTC resident “calling out”, unusual for her.

Request from RPN to order a urine R&M, C&S

Afebrile, no witnessed dysuria, VSS

Encouraged increased oral fluids, acetaminophen 1000 mg

“Call me again if anything changes overnight.”

Promised to see on rounds in the morning.

No CVA tenderness, no suprapubic tenderness

Grouped vesicles, dermatomal distribution.

Treated famciclovir with resolution of symptoms and rash.

Highlighting the importance of physical exam.

Quality Improvement Approaches

Tips for Implementing Local QI to Decrease Unnecessary Urine Testing

Work across healthcare sectors

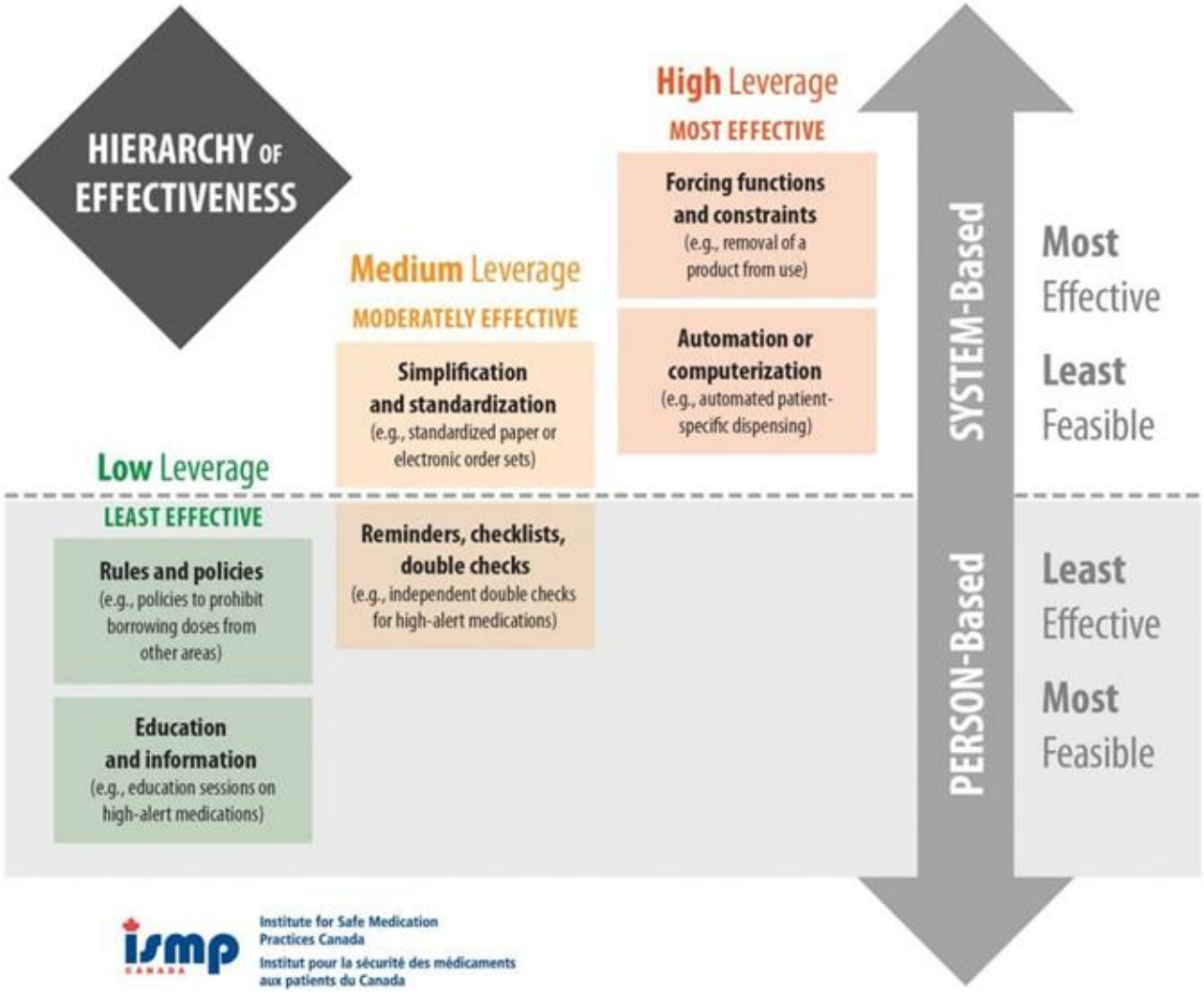
Significant clinician engagement/discussion needed

Engage antimicrobial stewardship partners

Review urine testing protocols/policies for alignment with evidence

Opportunities

- Removal of dipsticks
- Policies/procedures regarding laboratory testing
- Order sets
- Supporting clinician practice (education, training, tools)



Tools for Clinicians on How to Use Modified Loeb Criteria in Practice

and susceptibility testing.

Box 2

How to approach changes in a resident's clinical status while incorporating the minimum criteria for UTI

Resident is at baseline and does not meet minimum criteria for UTI

- Do not order urine culture and do not initiate antibiotics aimed at urinary tract infection

Resident has a change from baseline but does not meet minimum criteria for UTI

- Assess for alternative explanations such as volume depletion, constipation, skin breakdown, medication side effects, and other sources of infection such as respiratory or skin and soft tissue
- Do not order a urine culture but do order other targeted investigations as needed, and consider the need for encouraging increased fluid intake, monitoring, and early re-assessment for development of additional signs or symptoms

Resident has change from baseline and meets minimum criteria for UTI

- Assess resident for causes of change in status and in absence of clear alternative explanation (eg, medication change leading to delirium, other focus of infection)
- Urine culture indicated in presence of minimum criteria for UTI without a clear alternative explanation
- Consider the need for empiric therapy based on clinical suspicion and resident status, with plan to reassess based on urine culture results

Bladder Infection or Something Else?

Choosing Wisely Canada

Four things we do in the first 24-48 hours in long-term care

If a resident's behaviour or health changes and they don't show the minimum signs of a bladder infection, we need to check for other causes. To make sure we understand what's happening, here is our plan for the first 24-48 hours:

1 Check what's changed:

LOOK FOR:

- ☐ Changes in thinking/memory
- ☐ Tiredness/low energy
- ☐ Feeling weak
- ☐ Falls
- ☐ General discomfort/feeling unwell
- ☐ Mood change/increase in aggression
- ☐ Less ability to perform activities (functional status)

SEE IF THESE ARE SIGNS OF:

- ☐ Infections (respiratory, skin, or GI)
- ☐ Not enough fluids (dehydration)
- ☐ Medication interactions/side effects
- ☐ Not enough oxygen in the body (hypoxia)
- ☐ Low blood sugar (hypoglycemia)
- ☐ Unable to pee (urinary retention)
- ☐ Constipation

2 Watch and care:

- ☐ Look for changes in alertness or awareness
- ☐ Check vital signs more often (temperature, blood pressure, heart rate, and breathing)
- ☐ Encourage more fluids as often as resident can handle:
  - Drinking 1 litre (1L) of fluids over 24 hours (about 50-100 mL per hour when awake)

If any of these symptoms get worse, tell the health care provider (for example doctor, nurse) right away.

3 Check for bladder infection:

To rule out a bladder infection, we won't use a urine dipstick test because it's not helpful for older adults over 65. Instead, we'll check for the **minimum signs** of a bladder infection before sending the urine to a lab:

No catheter

Minimum signs include:

↓

- Sudden pain/burning while urinating

Or at least two of these:

- Fever over 37.9°c (100°f) or rises by 1.5°c (2.4°f) at least twice in 12 hours
- Having to urinate more often or right away
- Blood in urine (gross hematuria)
- Pain in the lower belly area (suprapubic pain)
- Pain in the side/back area (flank pain)
- Leaking urine you can't control (urinary incontinence)

↓

Don't meet minimum signs? A health care provider will do an assessment to check for other causes.

Catheter

Minimum signs include:

↓

- Fever over 37.9°c (100°f) or rises by 1.5°c (2.4°f) at least twice in 12 hours
- Pain in the side/back area (flank pain)
- Shaking chills
- Sudden confusion/trouble thinking clearly/can't focus (delirium)

↓

Don't meet minimum signs? A health care provider will do an assessment to check for other causes.

If a patient **meets minimum signs**, urine will be sent to the lab. A health care provider should be notified to decide if antibiotics are needed while waiting for the lab results.

Not signs of a bladder infection:

- Dark/cloudy or smelly urine alone
- Change in mental state alone

4 Plan next steps:

Symptoms better? If the symptoms get better or go away within 48 hours, it's unlikely it is an infection. The resident will be continuously checked on to make sure they feel better.

Symptoms worse? If the symptoms are staying the same or getting worse, and the patient does not meet the minimum signs for a bladder infection, a health care provider will perform an assessment.

1 Check What's Changed:

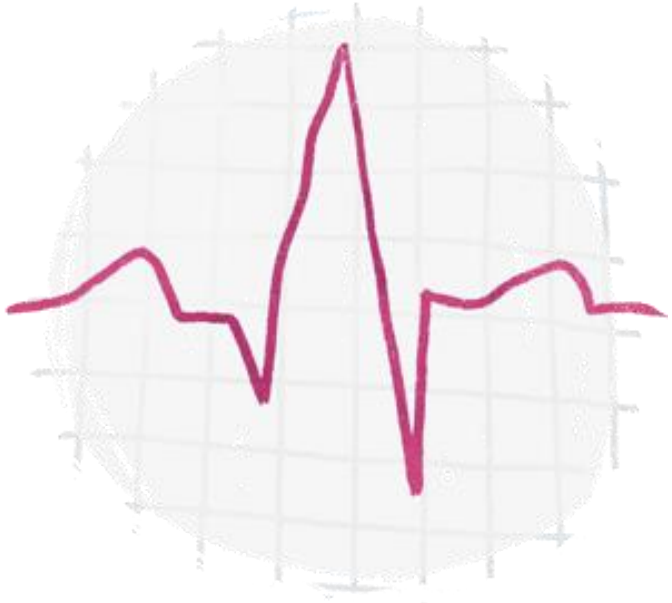
LOOK FOR:

- Changes in thinking/memory
- Tiredness/low energy
- Feeling weak
- Falls
- General discomfort/feeling unwell
- Mood change/increase in aggression
- Less ability to perform activities (functional status)

SEE IF THESE ARE SIGNS OF:

- Infections (respiratory, skin, or GI)
- Not enough fluids (dehydration)
- Medication interactions/side effects
- Not enough oxygen in the body (hypoxia)
- Low blood sugar (hypoglycemia)
- Unable to pee (urinary retention)
- Constipation

2 Watch and Care



Look for changes in alertness or awareness

- Check vital signs more often (temperature, blood pressure, heart rate, and breathing)
- Encourage more fluids as often as resident can handle:
  - Drinking 1 litre (1L) of fluids over 24 hours (about 50-100 mL per hour when awake)

If any of these symptoms get worse, tell the health care provider (for example doctor, nurse) right away

3 Check for Bladder Infection

To rule out a bladder infection, we won't use a urine dipstick test because it's not helpful for older adults over 65.

Instead, we'll check for the minimum signs of a bladder infection before sending the urine to a lab

No catheter

Minimum signs include:

- Sudden pain/burning while urinating

Or at least two of these:

- Fever over 37.9°c (100°f) or rises by 1.5°c (2.4°f) at least twice in 12 hours
- Having to urinate more often or right away
- Blood in urine (gross hematuria)
- Pain in the lower belly area (suprapubic pain)
- Pain in the side/back area (flank pain)
- Leaking urine you can't control (urinary incontinence)

Don't meet minimum signs? A health care provider will do an assessment to check for other causes.

Catheter

Minimum signs include:

- Fever over 37.9°c (100°f) or rises by 1.5°c (2.4°f) at least twice in 12 hours
- Pain in the side/back area (flank pain)
- Shaking chills
- Sudden confusion/trouble thinking clearly/can't focus (delirium)

Don't meet minimum signs? A health care provider will do an assessment to check for other causes.

If a patient meets minimum signs, urine will be sent to the lab. A health care provider should be notified to decide if antibiotics are needed while waiting for the lab results.

Not signs of a bladder infection:

- Dark/cloudy or smelly urine alone
- Change in mental state alone

4 Plan Next Steps

Symptoms better? If the symptoms get better or go away within 48 hours, it's unlikely to be an infection. The resident will be continuously checked on to make sure they are improving.

Symptoms worse? If the symptoms are staying the same or getting worse, and the patient does not meet the minimum signs for a bladder infection, a health care provider will perform an assessment.