

Medical Co-management of the Stroke Patient

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Disclosure

- I have no actual or potential conflict of interest in relation to this presentation

My Role

- Internal Medicine boarded, hospital medicine practice, primary focus on consults/comanagement

- Work with a variety of service lines, address acute medical issues, and provide approval on hospital complications
- Participate in daily table rounds on patients ranging from general medicine to critical care, specifically, with direct involvement
- Most common issues addressed: respiratory disorders, diabetes

8:40 AM – 9:00 AM Management of Hyponatremia in Neurological Diseases
Cathy Wentowski, MD

9:00 AM – 9:20 AM Fevers and infections in Patients with Stroke
Caley McIntyre, MD

9:20 AM – 9:30 AM BREAK/QUESTIONS/VISIT EXHIBITS

9:30 AM – 9:50 AM Management of Diabetes
Susan Karam, MD

9:50 AM – 10:10 AM Long COVID/Post-COVID Conditions
Liza DiLeo Thomas, MD

10:10 AM – 10:30 AM Drug Hypersensitivity – Evaluation and Management
Alicia Cool, MD

Session Goals

Recognize impact and prognostic value of fever and infections on patient care outcomes

Identify causes of fever frequently seen in conjunction with or following acute stroke

Formulate diagnostic and treatment approaches for acute stroke patients with fever and infection

Case

A 76-year-old man with paroxysmal atrial fibrillation is admitted with left-sided hemiplegia and neglect. He is admitted to vascular neurology for management of a right MCA stroke.

On the afternoon of day 3 of hospitalization, the nurse calls to report a temperature of 101.7° F obtained on routine vitals.

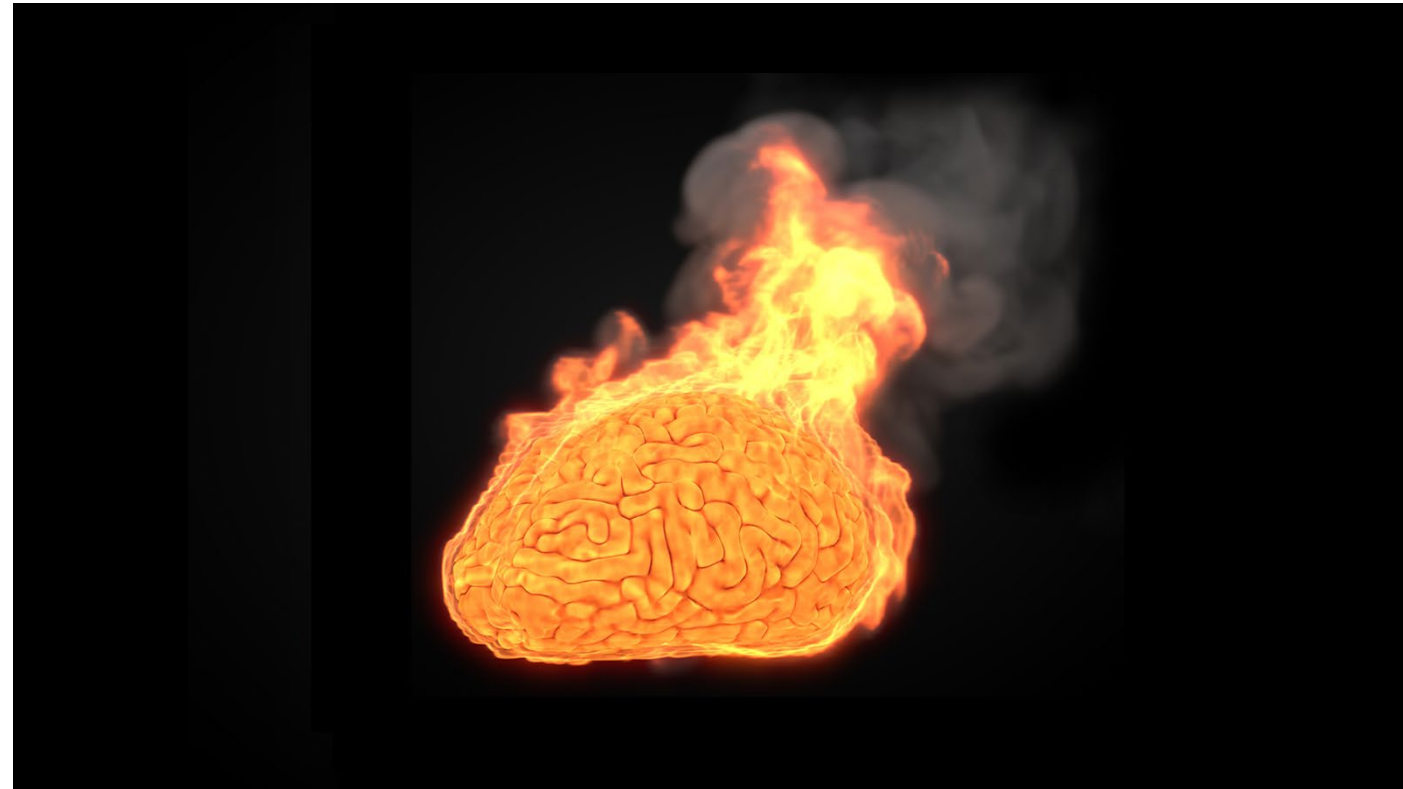
Is this expected? What are the implications?

What causes should be considered?

How should they be evaluated and treated?

Fever and Stroke – Epidemiology

- Fevers commonly affect patients admitted with acute stroke
 - 2011 retrospective cohort study of 1361 ischemic stroke patients identified fever events in 35.5% of admissions
 - Other studies have estimated even higher rates



Impact of Fevers on Outcomes

- Fever has been associated with poor outcomes in patients with stroke and other neurologic injury
 - 2008 meta-analysis showed elevated risk of elevated temperatures (relative to normothermia/lower body temperatures) across multiple outcomes, including mortality, functional outcomes, and length of stay

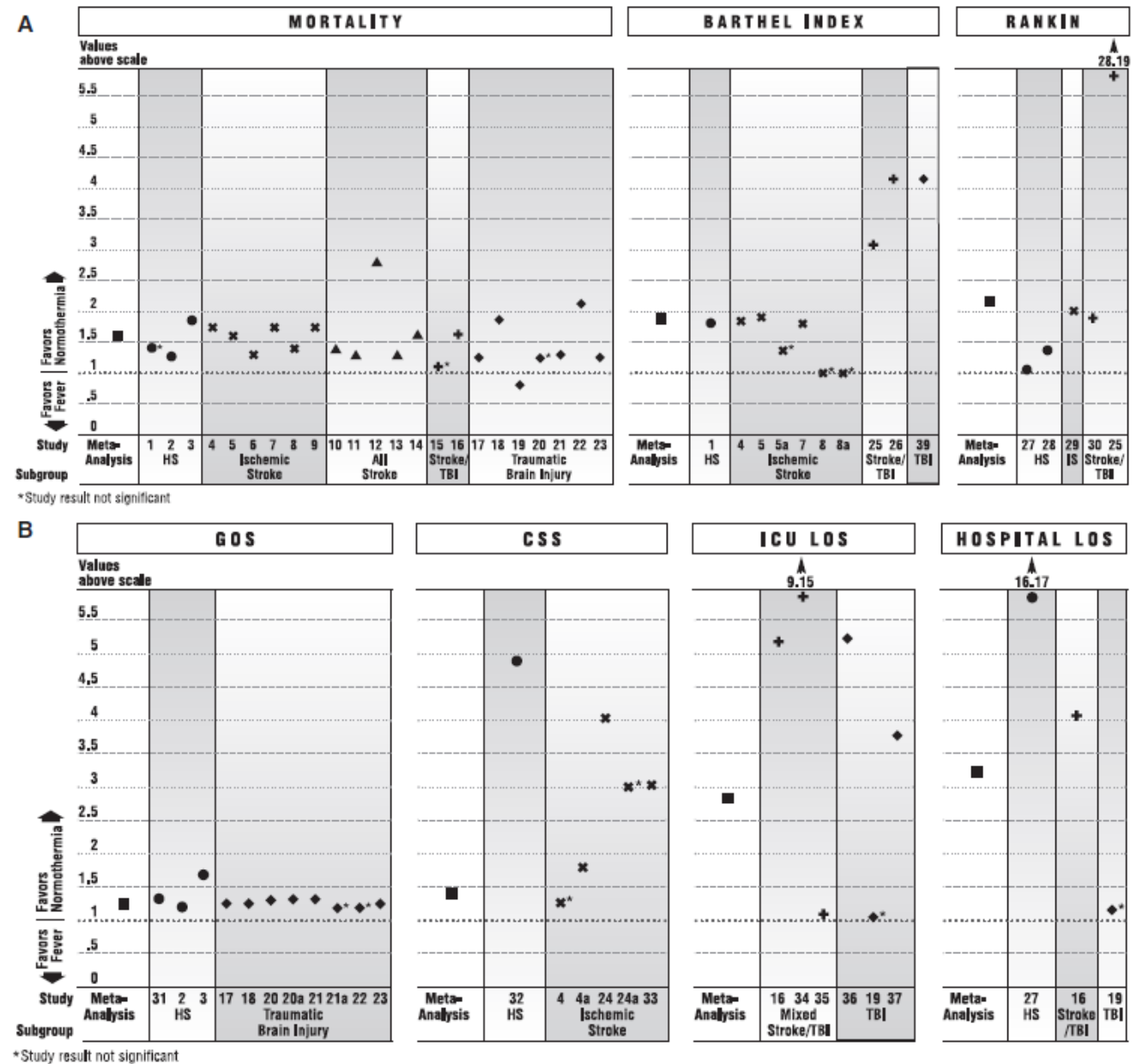


Figure 2. Relative risk of worse outcome with fever/higher body temperature.

Fever Burden and Outcomes

- Phipps et al correlated fever burden to poor outcomes, including primary outcome of combined death or discharge to hospice
- Notably, make-up of cohorts significantly different
 - Fevers cohort older, sicker, higher baseline NIHSS

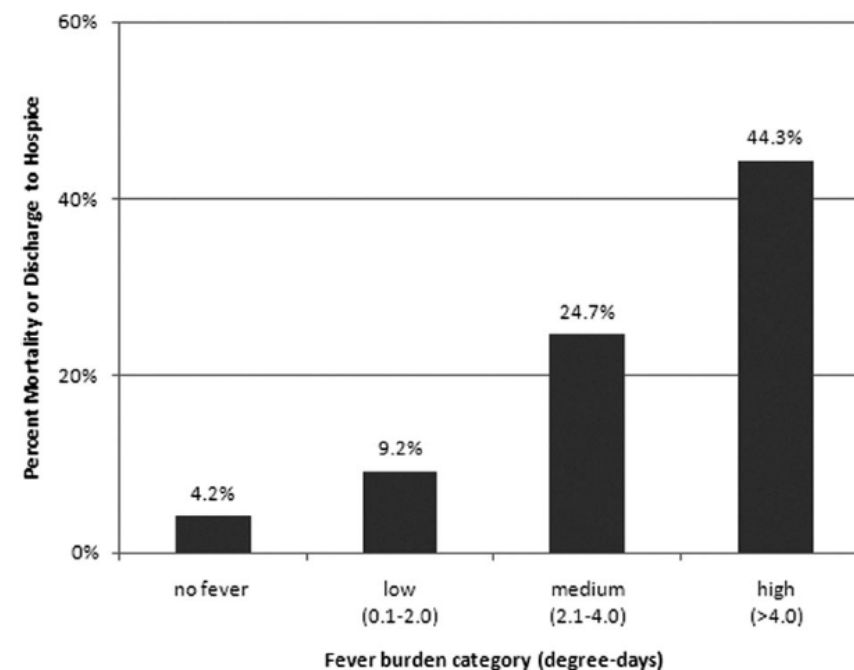


Figure. In-hospital mortality or discharge to hospice and fever burden.

Temperature management

- American Heart Associate/American Stroke Association recommend use of antipyretics (acetaminophen) for $T > 38^{\circ}\text{C}$
- European Stroke Organization Guidelines do not make a recommendation for treatment

3.3. Temperature	COR	LOE
1. Sources of hyperthermia (temperature $>38^{\circ}\text{C}$) should be identified and treated, and antipyretic medications should be administered to lower temperature in hyperthermic patients with stroke.	I	C-LD
Additional support for this recommendation unchanged from the 2013 AIS Guidelines is provided by a large retrospective cohort study conducted from 2005 to 2013 of patients admitted to intensive care units in Australia, New Zealand, and the United Kingdom. Peak temperature in the first 24 hours $<37^{\circ}\text{C}$ and $>39^{\circ}\text{C}$ was associated with an increased risk of in-hospital death compared with normothermia in 9366 patients with AIS. ¹³³		

Recommendation

In patients with acute ischemic stroke and hyperthermia, we cannot make any recommendation for treating hyperthermia as a means to improve functional outcome and/or survival.

Quality of evidence: Low/ $\oplus\oplus$

Strength of recommendation: Weak

Approaching the Evaluation

- Evaluate urgency
- Embrace clinical history and examination
 - Productive cough? Respiratory compromise? Abnormal breath sounds?
 - Pain or burning with urination? Suprapubic or flank tenderness?
 - Unilateral leg swelling and pain?
- Test thoughtfully
 - Blood cultures
 - UA and culture
 - CXR, respiratory cultures
 - Respiratory viral testing
 - Stool studies
 - Advanced imaging (US, CT, echo)

Infections and Stroke

- Infections commonly complicate the acute care of stroke patients
 - 2011 Meta-analysis of 87 studies found 30% of acute stroke admissions were complicated by infection
 - 10% Pneumonia
 - 10% Urinary Tract infections
 - 10% Other
- BUT, not all that fevers is infection
 - Aspiration pneumonitis
 - Venothromboembolic disease
 - Central fever
 - Drug fever
 - Other causes

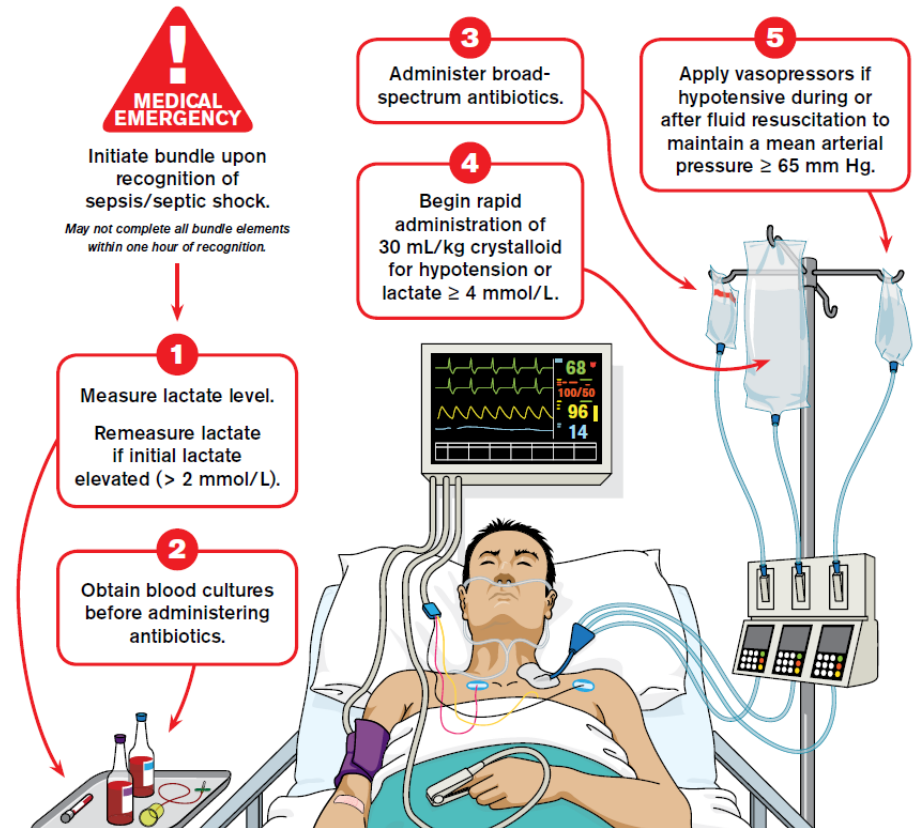
Sepsis

- Life-threatening organ dysfunction caused by a dysregulated host response to infection
- Requires timely identification and treatment
- No perfect screening tool

Hour-1 Bundle

Initial Resuscitation for Sepsis and Septic Shock

Surviving Sepsis Campaign



Pneumonia in Stroke

- Most commonly diagnosed ~2-4 days after stroke
- Often associated with/due to aspiration
- Generally considered hospital acquired



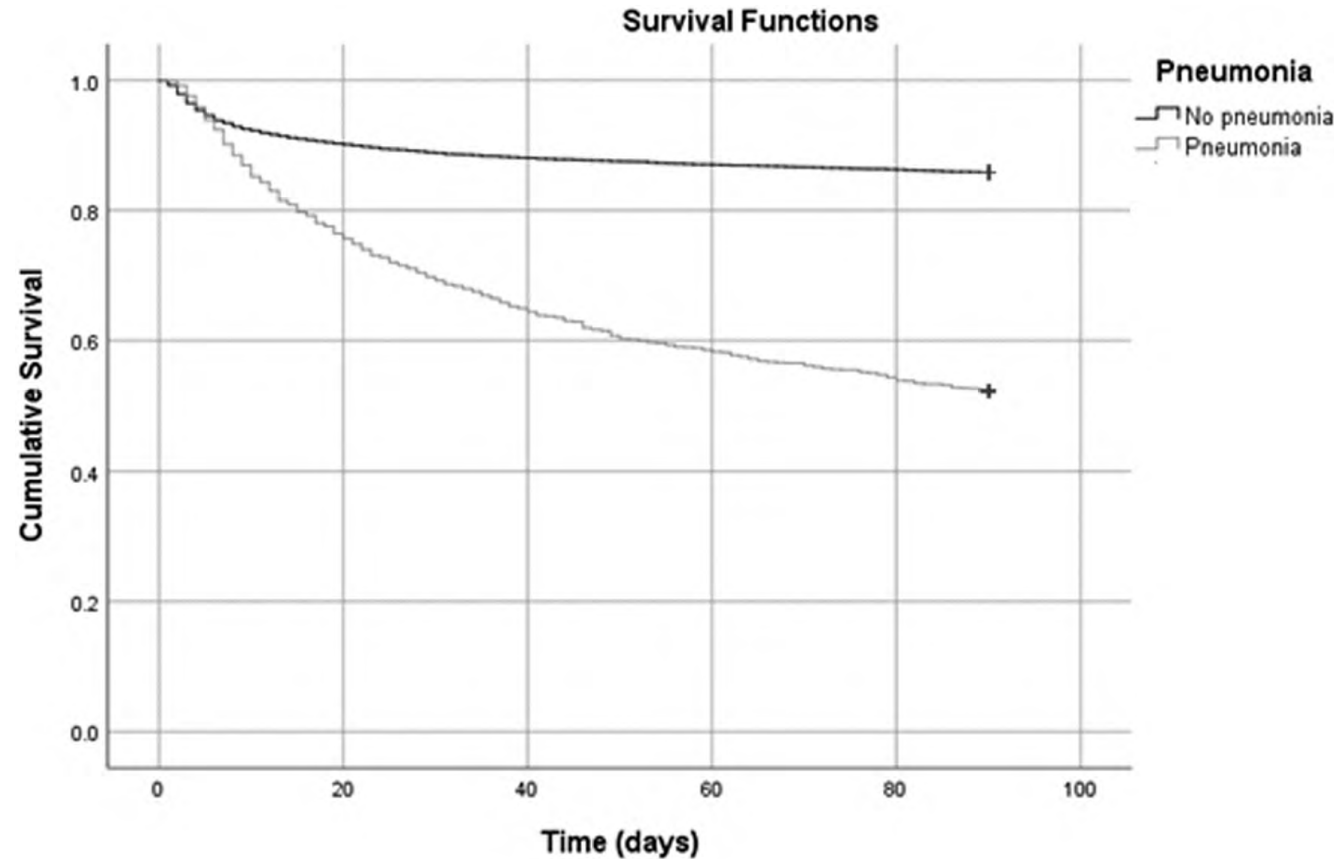
Predictors of Stroke Associated Pneumonia

Table 2 Predictors and associated ORs of post-stroke pneumonia

Predictor	Overall combined OR with <i>p</i> -value	I ² with <i>p</i> -value	Number of studies
Age [28, 39, 42–43, 45, 50–52, 54–57]	1.07 (1.04–1.11) <i>p</i> < 0.001	98.5% <i>p</i> < 0.001	12
Male [28, 32, 38, 44–45, 52–53, 55–56]	1.42 (1.17–1.74) <i>p</i> = 0.001	77.8% <i>p</i> < 0.001	9
NIHSS [28, 40, 42–33, 50–52, 55, 57]	1.07 (1.05–1.09) <i>p</i> < 0.001	82.4% * <i>P</i> < 0.001	9
Dysphagia [29, 34, 38, 42–45, 48, 51–52, 57]	3.53 (2.69–4.64) <i>p</i> < 0.001	86.6% <i>p</i> < 0.001	11
Nasogastric tube [29, 31, 33, 49, 54]	5.29 (3.01–9.32) <i>p</i> < 0.001	65.3% <i>p</i> = 0.01	5
Diabetes [35, 38–39, 47, 50, 52, 54, 56]	1.15 (1.08–1.23) <i>p</i> < 0.001	77.9% <i>p</i> < 0.001	8
Mechanical ventilation [29, 44, 49, 54]	4.65 (2.50–8.65) <i>p</i> < 0.001	61.8% <i>p</i> = 0.02	4
Previous stroke [32, 46, 50]	1.03 (0.96–1.10) <i>p</i> = 0.438	77.5% <i>p</i> < 0.001	3
Smoking [42–43, 50]	1.16 (1.08–1.26) <i>p</i> < 0.001	75.6% <i>p</i> < 0.001	3
COPD [23, 42–43]	4.48 (1.82–11.00) <i>p</i> = 0.001	81.1% <i>p</i> < 0.001	3
Atrial fibrillation [38, 42, 50]	1.37 (1.22–1.55) <i>p</i> < 0.001	93.7% <i>p</i> < 0.001	3
Dysphagia screening [39, 41, 50]	1.17 (0.95–1.43) <i>p</i> = 0.145	91.5% <i>p</i> < 0.001	3
Hypertension [36, 39, 50]	0.95 (0.87–1.04) <i>p</i> = 0.232	85.1% <i>p</i> < 0.001	3

Pneumonia and Associated Outcomes

- Higher mortality rates
- Longer length of stay
- Higher rates of dependency at discharge



Treatment and Prevention

Evaluation/Treatment

- Obtain respiratory cultures
- Empiric antibiotic coverage for *S. aureus*, *Pseudomonas*, gram negative bacilli based on unit resistance patterns, tailor to culture results
- 7 day total course

Prevention

- Avoid unnecessary PPI/H2 blocker use
- Dysphagia management (NPO status, early assessment, dietary modification)
- Prophylactic antibiotics not recommended

Urinary Tract Infections in Stroke

- Associations
 - Female Sex
 - Older age
 - Higher levels of disability
 - Urinary retention
- Diagnosis
 - Symptoms + pyuria/bacteruria
 - Simple vs Complicated
- Management
 - Empiric antibiotics covering gram negative bacilli
 - Tailor to culture results
 - Duration
- Prevention
 - Avoid/minimize use of internal urinary catheters

Other Fevers in Stroke

- Central fevers
- DVT
- Blood transfusion
- Post-myocardial infarction syndrome (Dressler Syndrome)
- HSV encephalitis
- Thyroid Storm
- Endocarditis

Sources

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