HIV Testing: Support for Routine Screening
EDWARDS, VAUGHAN

Acute Kidney Injury with Polyuria in a Patient with HIV
SILVER, RICHARDSON
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35 Acute Kidney Injury with Polyuria in a Patient with HIV
   Samuel A. Silver, MD, Robert Richardson, MD
It has been approximately 35 years since the initial clinical presentation of HIV/AIDS in North America. At that time, the terminology of HIV and AIDS did not exist. I can still recall the patient I treated when I was an intern, that with hindsight, I believed was my first patient with AIDS, a young gay male who died in our ICU due to an unknown cause (even after autopsy).

A year later, the Center for Disease Control published in the Morbidity and Mortality Weekly Report, five cases of previously healthy, young gay men in Los Angeles who were diagnosed with Pneumocystis carinii pneumonia. Subsequently more cases of acquired immune deficiency filled the literature and the disease was eventually called AIDS. A couple of years later the etiology was identified as HIV.

During that time period, the practice of hospital-based internal medicine underwent a remarkable transformation. As residents, we saw the medical wards becoming overwhelmed by patients with AIDS defining conditions. We would treat the complications but had little optimism that we could curtail the expanding morbidity and mortality of the disease. Informing a patient that they had AIDS felt like you were handing them a death sentence, with approximately 50% mortality within 6 months and no one seemed to live beyond two years.

By the end of the 1980s the tide began to turn with the development of effective HIV treatments that stalled the development of AIDS in HIV infected individuals. Since then, numerous antiviral therapies have become available and life expectancy can be measured in decades. There are still challenges and complications associated with HIV therapy but we no longer see the large numbers of patients being admitted to the medical wards with AIDS- defining conditions, and where we would focus our attention on palliation.

Although in less affluent countries treatment options for HIV may still be inadequate, in Canada effective treatments are widely available, and it is important that we identify patients with HIV who are asymptomatic. This will permit us to treat these patients and reduce their risk for AIDS, as well as reducing the risk for HIV transmission to others through awareness. In this issue of CJGIM Edwards and Vaughan (p. 20) discuss the evolving guidelines of HIV screening. It behooves us as physicians to follow these recommendations and to take the necessary steps in clinical practice that will identify HIV infected persons so that appropriate treatments and counselling can be implemented.

Mitch Levine

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Il y a 35 ans environ, nous observions le premier cas clinique de VIH/sida en Amérique du Nord. À cette époque, les termes VIH et sida n’existaient pas. Je me souviens encore très bien du patient que j’ai traité alors que j’étais un résident, mon premier patient atteint du sida en fait, un jeune homosexuel qui est décédé à l’unité de soins intensifs de cause inconnue (pas décelée à l’autopsie non plus). Un an plus tard, les Centers for Disease Control rendaient compte, dans Morbidity and Mortality Weekly Report, de cinq cas de pneumonie due à *Pneumocystis carinii*, de jeunes homosexuels de Los Angeles jusque-là bien portants. Par la suite, les cas de syndrome d’immunodéficience acquise se sont faits de plus en plus nombreux dans la littérature, et la maladie a trouvé son nom, le sida. Quelques années plus tard, l’on en a cerné l’étiologie, le virus de l’immunodéficience humaine (VIH). Au cours de ces années, la pratique de la médecine interne hospitalière s’est grandement transformée. Nous, les résidents, avons vu les unités de médecine se remplir de patients atteints de maladies définissant le sida. Nous pouvions traiter les complications, mais nous étions pessimistes quant à la possibilité de freiner la morbidité et la mortalité fulgurantes liées à la maladie. Dire à un patient qu’il était atteint de sida, c’était signer son arrêt de mort; à ce moment-là, le taux de mortalité était de 50 % dans les six mois, et personne ne survivait plus de deux ans.

À la fin des années 1980, la vapeur a commencé à se renverser à l’émergence de thérapies antirétrovirales capables de freiner l’évolution de l’infection à VIH. Depuis lors, les antirétroviraux se sont multipliés et l’espérance de vie des personnes infectées s’échelonne désormais sur des dizaines d’années. Le traitement de l’infection pose toujours des défis et des complications surgissent encore, mais les patients atteints d’une maladie liée au sida, pour qui nous nous concentrons sur la palliation, se font plus rares aux unités de soins.

Il est vrai que les options destinées au traitement de l’infection à VIH sont insuffisantes dans les pays en développement, mais les traitements efficaces sont répandus au Canada, d’où l’importance de dépister les cas d’infection à VIH asymptomatiques. Ainsi, nous pourrons les traiter et réduire non seulement le risque d’apparition du sida, mais également le risque de transmission du VIH par l’information et la sensibilisation. Dans le présent numéro de *La Revue canadienne de médecine interne générale*, Edwards et Vaughan examinent les lignes directrices sur le dépistage du VIH. Il nous incombe, à nous les médecins, de mettre en œuvre ces recommandations et d’adopter les mesures nécessaires en pratique clinique pour dépister les personnes infectées par le VIH et leur offrir le traitement et le counseling appropriés.

Mitch Levine
Introduction

Fortunately, trauma care is evolving rapidly. Unfortunately, trauma is still ubiquitous and still one of the leading causes of death, especially amongst the young. Trauma skills are now widely taught to surgeons and non-surgeons alike via courses such as the Advanced Trauma Life Support course and the Simulated Trauma and Resuscitation Team Training course. These practical courses emphasize that the initials “MD” really mean “make a decision.”

Medical practitioners should understand trauma as a complex, multisystem, and multistage disease. For example, major trauma can cause enormous physiological stresses. This means that frail patients may not survive the acute insult and that others will be left battling the medical consequences (infections, myocardial damage, rhabdomyolysis, wound healing, etc.). Trauma also creates substantial psychological burdens for both patients and caregivers, whether through lost income, depression, divorce, or post-traumatic stress.

Summary

“Surgical Insights for the Non-surgeon,” or SINS, is composed of several short chapters intended to cover fundamental surgical knowledge for non-surgeons. The authors focus on surgical pearls, operative insights, and applied anatomy. In Chapter 10 of this series, the authors address trauma as a complex, multisystem, and multistage disease.

Résumé

L’ouvrage « Surgical Insights for the Non-surgeon » (aperçu de la chirurgie à l’intention du non-chirurgien) se compose de courts chapitres couvrant les connaissances fondamentales en chirurgie. Les auteurs se concentrent sur des enseignements tirés de leur expérience, des aspects opératoires et l’anatomie appliquée. Dans le chapitre 10 de cet ouvrage, les auteurs abordent le traumatisme et les approches médicales qui le considèrent comme une maladie multisystémique complexe et évolutive.

The only bleeding which you should fear is that which is your own and that which you can hear.
— Old surgical maxim
Above all, there is a growing acceptance that in order to vanquish trauma, we need comprehensive and robust systems, not just doctors trained in isolation. Trauma is evolving into a fascinating science that blends knowledge, manual skills, ongoing practice, and system-wide commitment. Accordingly, trauma belongs in the bailiwick of both surgeons and non-surgeons. This chapter offers a basic primer. If you can establish the mechanism, apply anatomy, and find a modicum of courage, then patients may increasingly live to tell the tale.

Trauma Death
There are three peaks of trauma death:

- **The first, within minutes**
  - Almost 50% of trauma deaths
  - Injuries include rupture of major vessels, heart, and brainstem
  - Patients are dead at the scene; nothing to do except to prevent future traumas
- **The second, within hours**
  - Approximately 30% of deaths
  - Approximately half from bleeding, half from head injury
- **The third, within days to weeks**
  - Approximately 20% of deaths
  - Most commonly associated with infection and multiorgan failure

Treatment
Basic Principles
Move patients from the injury site to definitive care, quickly and safely. This includes:

- Evaluation of the accident scene
  - Ensuring the safety of rescuers
  - Determining the mechanism
- Initial assessment and critical interventions
  - Establishing what will kill the patient first
  - Addressing the airway, breathing, and circulation (A,B,Cs)
- Activating the trauma team
- Treatment before (or concurrent with) diagnosis
  - Treat without the luxury of a full history and physical
  - An AMPLE (Allergies, Medications, Previous health, Last meal, Events) history usually suffices
  - The priority is to save life and limb

Damage Control
Minimize acute intervention:
Don’t make it worse than it already is!

Damage Control Resuscitation

- **Permissive hypotension**
  - Systolic blood pressure (SBP) approximately 90 mm Hg
  - Avoid higher pressure, which can dislodge clots and restart the bleeding
- **Minimize crystalloids by using early blood products**
- **Control bleeding surgically (i.e., by ligation and/or abdominal packing) and/or via interventional radiology**
- **Further resuscitation in intensive care unit (ICU) once bleeding is controlled**
- **Mitigate the “lethal triad of death”**

Damage Control Surgery

- **Perform the least amount of acute surgery on critically unstable patients**
- **Two goals**
  1. Stop bleeding
  2. Minimize contamination
- **Three stages**
  1. Control bleeding/contamination, 2. Get out fast, 3. Get the patient to ICU
  - Suture ligate vessels, rapidly remove bleeding organs (aka damaged and “take-outable” organs), insert surgical packs, +/- interventional radiology
  - Suture closure or stapling of intestines, washout; no anastomoses or ostomies
  - Leave the fascia open (open abdomen equals less chance of compartment syndrome)
  - “You control the open abdomen; the closed abdomen controls you”
    — Old surgical maxim
  2. Resuscitate (in ICU)
  - To correct hemodynamics and achieve physiologic homeostasis
  - To prevent the “lethal triad of death” (see above)
  3. Complete the surgery (anastomoses, wound closure), but only once the patient is stable

Hypothermia

Coagulopathy
Acidosis
Crisis Management

• Nontechnical skills are just important as technical skills!
• You coordinate a whole team to save a single patient
  - Communication is the number one determinant of whether trauma teams work or fail
  - “Closed-loop” communication
    o Everything said demands a clear response
    o Confirms that instructions were said out-loud; understood; and done
  - Communication helps to
    o Create a shared mental model
    o Coordinate and prioritize tasks
    o Control emotions
• “Failing to plan equals planning to fail”
  - Understand the benefits of “thinking ahead of the crisis”
  - “Never let a patient deteriorate to a state that you haven’t already thought about”

Primary Survey: the ABCDE of Trauma (Airway, Breathing, Circulation, Disability, Exposure)
(A) Airway

• Assess immediately; reassess frequently. Go back to first principles (airway, breathing, and circulation—“the ABC’s”) whenever the patient worsens
• Pearl 1: Patients who can talk are usually protecting their airways
• Pearl 2: Patients who have stridor/vocal change usually get worse
• Pearl 3: Airway patency (airway opening for gas exchange) differs from airway protection (i.e., inserting a tube to prevent vomiting/further deterioration)
• Pearl 4: Take time to position the airway (unless C-spine injury precludes)
  - Optimal positioning is same for oxygenation/ventilation/bagging/intubating: flex lower C-spine; extend atlanto-occipital joint, ears in front of sternum
  - Perform a chin lift and jaw thrust to improve airway patency
• Pearl 5: If there is a C-spine injury or suspicion of one
  - Get the C-spine collar on, and get help early!
  - You can still use a chin lift, but no jaw thrust
  - You can still have the whole bed in Trendelenburg position (i.e., head higher than feet)
  - For intubation, use in-line stabilization, or bronchoscope, or GlideScope®
• Pearl 6: Signs that the airway may become an issue (even if the patient is currently stable)
  - Trauma to the face and oro- or nasopharynx
  - Facial burns
  - Stridor and noisy breathing
  - Agitated patient (may be hypoxemic, acidemic)

Airway Management: Temporizing the Airway

• Give lots of oxygen: high flow and high concentration
• Maintain a patent airway
  - Means keeping the naso/oro/palato/laryngopharynx open
  - Can use an oropharyngeal airway (OPA)
    o Insert bevel up; turn bevel down when past the hard palate
    o Size the OPA from mouth to angle of the jaw
    o Awake patients may not tolerate an OPA
      (fortunately, awake patients may not need an OPA!)
• Bag valve mask (BVM)
  - An essential skill, even more important than endotracheal intubation; thus, master and maintain your BVM skills
  - One-person technique
    o One hand on the bagger, one hand on the mask
    o The mask hand is placed in an “ok position”. The thumb and index finger create an “O” on the mask top; three fingers create a “K” on the mandible and jaw angle
  - Two-person technique
    o First person uses both hands to squeeze the bag
    o Second person uses both hands to hold the mask on face, and lifts the jaw with the fingertips
  - Connect high-flow oxygen to the bagger. If the reservoir bag is not distended, then increase the oxygen flow until the bag inflates

Airway Management: Protecting the Airway

• “Definitive airway” is defined as a tube in the trachea with cuff inflated
  - Most commonly achieved with oral endotracheal intubation
  - Connected to 02 and with ventilation via bagger or mechanical ventilator
• Endotracheal intubation
  - Achieves both a patent and protected airway
  - “Intubate anyone who can’t talk you out of it,” or “if Glasgow Coma Scale (GCS) score <8, intubate”
  - “More-sophisticated” ways to assess if artificial airway is needed
    o Inability to oxygenate; ventilate
    o Tachypnea (respiratory rate [RR] >30), bradypnea (RR <5)
Hypoxemia (Pao$_2$ <60 or O$_2$ saturation <90%), hypercarbia (Paco$_2$ >40)

- Tachypnea is the single best vital sign for predicting patient deterioration (better than heart rate, O$_2$ saturation, blood pressure, etc.)
- Neck compression with edema/bleeding; significant zone 2 or 3 neck injury
- If future airway obstruction is anticipated
  - Thermal airway damage (gets worse before better)
  - Expanding hematoma, voice change
- Combative patients, lengthy transports
- “If in doubt, there is no doubt”

- Supralaryngeal rescue devices
  - Laryngeal mask airway (numerous types; get to know a few)
  - Esophageal obturator airway (King Tube, Combitube, Cobra)
- Surgical airway
  - Rarely needed, but desperately needed when needed!
  - Regular practice is required for the “big day”
  - Give yourself a priori mental permission
Otherwise, patients get a surgical airway when it’s too late
  - Needle cricoid technique is being gradually supplanted (see “Head and Neck SINS” for technique)
  - Get an “all-in-one” cricothyroidotomy kit

### (B) Breathing

- Airways, breathing, and circulation (the ABC’s) are usually managed simultaneously, not sequentially. However, once the airway is secured, focus on breathing.
- Screen for deadly issues in breathing
  - Simple pneumothorax
    - Suspected by injury pattern (bruised thorax, damaged steering wheel)
    - Diagnosed by low oxygen saturation, hemithorax not moving, absent breath sounds, tympanic to percussion
    - Confirmed by chest radiography (CXR), but only if the patient is stable enough for an x-ray to be obtained
    - Air in the pleural space: apical air if upright on chest x-ray (CXR) (Figure 1), but hidden in sulcus (“deep sulcus sign”) if supine
    - Insert a chest tube and attach to underwater suction
    - All pneumothoraces require a chest tube if plans for surgery, lengthy mechanical ventilation, or transport (especially by air)
  - Tension pneumothorax
  - Air pushes the mediastinal structures, and the heart cannot fill

- A life-threatening emergency resulting in hemodynamic deterioration and death if not treated
- Do not wait for confirmation by CXR
- Immediate needle decompression to the second intercostal space with a large-gauge Angiocath. This converts tension pneumothorax to simple pneumothorax; therefore, you still need a chest tube after the needle.

- Hemotorax
  - Blood in the pleural space
  - Diagnosed by opacification on CXR, low oxygen saturation, hemithorax not moving, absent breath sounds, dullness to percussion
  - Massive hemothorax is defined as >1,500 cc drained or >200 cc/hr
  - Notify your friendly general or thoracic surgeon

- Lung contusion, cardiac contusion, and rib fractures
  - Usually managed conservatively
  - However, pain may prevent patients from taking adequate breaths
  - So, close monitoring is required

- Flail chest
  - When part of rib cage is separated from the rest of the chest wall
  - Almost always associated with underlying lung contusion
  - At least two fractures per rib, and in at least two ribs
  - Fractured or unconnected ribs move paradoxically (in with inspiration, out with expiration)
  - Surgery is rarely indicated

- Open pneumothorax or sucking chest wound
  - If the hole is greater than two-thirds airway size, air is sucked into the pleural space
  - Which increases the pneumothorax, which can become a tension pneumothorax
  - A three-way dressing can prevent ingress, and allow egress
• Circulatory shock
  - Means cellular supply/demand imbalance
  - Manifests early as lactic acidosis
  - Manifests late as multisystem organ failure…and death! (“Time is tissue”)
  - The body tries to compensate via its sympathetic nervous system
  - Tachycardia, tachypnea, decreased pulse pressure, peripheral vasoconstriction, and decreased urine output (U/O) are the keys to recognizing the patient in-peril
  - BEWARE: sympathetic response may be blunted by the patient’s medications or by severe injury
• Causes of shock in trauma
  - Top three causes are (1) bleed, (2) bleed, and (3)…bleed!
  - Hypovolemic causes
    - External bleeding
    - Hemorrhax
    - Hemoperitoneum
    - Pelvic fracture
    - Long bone fracture
  - Obstructive causes
    - Pericardial tamponade
    - Tension pneumothorax
    - Massive pulmonary embolus (typically in chronic stages)
  - Cardiogenic causes
    - Blunt cardiac trauma
    - Dysrhythmia
    - Myocardial infarct
    - Hypoxia causing myocardial dysfunction
  - Neurogenic and spinal causes
    - Loss of sympathetic stimulation, due to spinal cord injury
    - If associated with bradycardia, consider brain injury
• Classifying severity of hypovolemic shock
  - Class 1: normal heart rate (HR) and blood pressure, anxious, <15% blood loss (<750 cc)
  - Class 2: tachycardia, anxious, slight decrease in U/O, 15–30% blood loss (750 cc–1.5 L)
  - Class 3: hypotensive, decrease in level of consciousness (LOC), decrease in U/O, 30–40% blood loss (1.5–2 L)
  - Class 4: hypotensive, HR >140, lethargic, no U/O, >40% blood loss (>21)
• Treating circulatory shock
  - Concurrent ABC; identify and reverse the source of shock
  - Early recognition and response is key
  - Insert large-bore intravenous (IV)
    - Does not have to be a central line (flow is actually lower in longer, skinnier central lines)
    - Peripheral intravenouses (PIVs) are usually also faster to insert; therefore: insert large-bore PIVs bilaterally
    - Run a drive line to decrease the “bag-to-bloodstream time”
  - Give 2 L of crystalloid and then reassess
    - Early blood-product resuscitation for ongoing bleeding and/or significant hemodynamics instability
    - Limited; no role for synthetic colloids (they may worsen coagulation and renal function)
  - Major sources for major bleeds are the chest, abdomen, retroperitoneum, pelvis, and long bones. Once the source is found, stop the bleeding!
    - Apply a tourniquet proximal to externally bleeding extremity sites.
    - Remove tourniquet before limb necrosis occurs
    - But don’t be scared to use a tourniquet (the patient needs to arrive alive first!)
    - Traction-splint long bones early
    - Bind pelvic fractures with sheet or commercial binder
    - Drain hemotorax with a chest tube
    - Early surgical consultation, and rapid transport to operating room (OR) for hemoperitoneum or transient/nonresponders

Figure 1: CXR showing pneumomediastium and bilateral pneumothorax with right lung contusions

(C) Circulation
• Resuscitation goals
  - SBP > 90 mm Hg
  - Saturation > 90%
  - Urine output > 0.5 mL/kg/hr
  - Lactate < 2 mmol/L
  - Base deficit between +2 and −2

(D) Disability (Neuromologic Status)
Assess via the GCS (Table 1):

• The sum of eye opening, verbal response, motor movement
  - GCS classifies brain injury severity into i) severe (GCS is 3-8), moderate (GCS is 9-12), or mild (GCS 13-15) (Table 1).
  - The lower the GCS score the greater the overall injury or likelihood of intracranial mass lesion requiring neurosurgical decompression
  - GCS score equals the sum of the best response in each of three categories
  - Use central pain, not peripheral
  - Becomes confusing when the patient is intubated, can’t talk, or is sedated.
  - If intubated, then usually ignore the verbal score
  - Therefore do the GCS out of ten, not out of fifteen
• Examine pupils for size, equality, and reaction

(E) Exposure and Environment

• Assess external injuries, and remember to check patient’s temperature
• Undress patient, but take care to maintain normal temperature. This minimizes the detrimental effect of hypothermia on coagulation
• Log-roll the patient (you will need help; this is not a one-person job)
• Give warm fluids; use warming blankets

Secondary Survey

• Only once the ABCDE primary survey is done and or stable
• Head-to-toe examination (again, only once life-threatening ABCD injuries are addressed)

Tertiary Survey

• Do a “sit-down” trauma review once the patient is transported/stabilized/admitted.
• Identify and catalogue all injuries after resuscitation and operative intervention
• Usually within 24 hours (“once the dust has settled”)
  - Repeat the primary and secondary surveys
  - Review laboratory data and radiographic studies; repeat when the patient is able to communicate complaints
  - New physical findings require further study in order to rule out missed injuries
• Tertiary survey done because 2–50% of life-threatening and non-life-threatening injuries are missed (higher for blunt trauma than for penetrating trauma)

Trauma Transport: When and Where to Transfer a Patient with Trauma

• In general, this is no different than for other illnesses, i.e.:  
  - When the patient’s needs exceed local resources or personnel
  - When the patient has a likelihood of further deterioration
• Based upon (1) mechanism, (2) anatomy, and (3) physiology
  - Significant mechanism (i.e., high-speed motor vehicle crash; fall from a significant height)
  - Anatomy concerns (i.e., penetrating neck injury, chest/abdomen injury, mangled extremities)
  - Aberrant physiology
    - Nonresponders or transient responders
    - Patient hypotensive and shocky despite resuscitation
• Five clues that a patient needs a higher level of care
  - Need for emergent airway intervention (see below)
  - Initial GCS score <11
  - Need for blood transfusion
  - SBP <100 or >220 mm Hg
  - Respiratory rate <10 or >30 breaths per minute

Table 1. Glasgow Coma Scale Score

<table>
<thead>
<tr>
<th>Eyes</th>
<th>Open spontaneously (4)</th>
<th>Open to Voice (3)</th>
<th>Open to Pain (2)</th>
<th>No opening (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>Normal speech (5)</td>
<td>Confused speech (4)</td>
<td>Words only (3)</td>
<td>Sounds only (2)</td>
</tr>
<tr>
<td>Motor</td>
<td>Spontaneous (6)</td>
<td>Localizes or crosses midline (5)</td>
<td>Withdrews to pain (4)</td>
<td>Flexor posturing (3)</td>
</tr>
</tbody>
</table>
• Transfer a patient with trauma to a trauma centre
• Trauma centres are designated as levels I through IV (see Table 2)

Table 2. Levels of Trauma Centres

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>Regional (often university) hospital Can care for all injuries (brain, thoracic, cardiac, etc.) Provides leadership and advice for other hospitals</td>
</tr>
<tr>
<td>Level II</td>
<td>Usually the largest facility in a community Can be an academic, public, or private institution If no Level I centre, then Level II provides education/leadership</td>
</tr>
<tr>
<td>Level III</td>
<td>Prompt assessment, resuscitation, stabilization, surgery Arranges transfer to a higher-level facility when necessary Maintains continuous general surgery coverage</td>
</tr>
<tr>
<td>Level IV</td>
<td>Rural facility; initial assessment of injured patients 24-hour emergency coverage by a physician Transfer agreements with Level I, II, or III trauma centres</td>
</tr>
</tbody>
</table>

Head-to-Toe Trauma
Central Nervous System
(Brain and spine trauma are covered in “Central Nervous System SINS”)

Neck Trauma
• Penetrating neck injuries are more common than blunt injuries
• To the OR if
  - Hemodynamic instability
  - Odynophagia, subcutaneous emphysema
  - Bubbling from the wound, stridor, hoarseness
  - Obvious vascular injury (active bleeding, expanding hematoma, cervical bruit)
• Trauma neck anatomy divides the neck into zones I, II, and III
  - Zone I
    - Landmarks: clavicles to the cricoid cartilage
    - Contents: vertebral artery, proximal carotid artery, major thoracic vessels, superior mediastinum, lungs, esophagus, trachea, thoracic duct, spinal cord
    - High mortality following injury, due to the major vessels and difficult surgical access
  - Zone II
    - Landmarks: cricoid cartilage to the angle of the mandible
    - Contents: carotid and vertebral arteries, jugular veins, esophagus, trachea, larynx and spinal cord
    - Most common zone of neck injury
    - Investigate surgically or via computed tomography (CT), bronchoscopy, esophagoscopy if hemodynamically stable
  - Zone III
• Landmark: angle of mandible to the base of the skull
• Contents: carotid and vertebral arteries, pharynx and spinal cord, salivary gland and pharynx; difficult to surgically access
• Neck is also divided by a fascial plane, the platysma
  - The platysma is a large, thin, muscle sheet from facial muscles to thorax
  - Numerous vital structures near by
  - Therefore zone II injury that penetrates the platysma needs surgical consultation and exploration
  - If no immediate indication for OR) then advanced imaging and endoscopy in an experienced centre
• Never explore a neck wound in the emergency room
• Tracheal and esophageal injuries are associated with mortality and morbidity; Therefore, maintain a high suspicion and a willingness to investigate.

Thoracic Injuries
• Thorax is divided into chest wall, mediastinum, pleural space, and lungs
• Up to 25% of trauma mortality
• Only 20% of thoracic trauma cases require surgery; most can be managed with tube thoracotomy
• Surgery is typically required for
  - Massive hemothorax: >1,500 mLs of blood from chest tube or 200 mL/hr × 4 hr
  - Open pneumothorax
  - Continuous air leak
  - Continuous bleed from lung parenchyma
  - Cardiac injury with tamponade
  - Major vessel tear
  - Esophageal tear
  - Diaphragmatic rupture
  - Cardiac arrest (traumatic arrest)
    - Emergency room (ER) thoracotomy/aortic cross-clamping
    - Only in penetrating trauma
    - Only if there was previous, witnessed cardiac activity
• In contrast, rib fractures, flail chest, and sternal fractures are managed medically
  - Pain control nonsteroidal antiinflammatory drugs (NSAIDs), narcotics, epidural, intercostal block
  - Pulmonary toilet
  - Increased risk of pneumonia
  - Be alert for additional injuries due to nearby structures
    - If fractured ribs 1–3: major vessel injury
    - If fractured 3–8: lung injury
    - If fractured ribs 9–12: spleen and liver injury
Injuries to Lung Parenchyma

• Typically a result of contusions following blunt trauma or lacerations following penetrating trauma
• Lung contusions are managed supportively with pulmonary toileting and mobilization.
• Pneumonia is the most common complication (up to half of all patients)
• Most lacerations are managed with chest tube only
• Parenchymal bleeds are from the low-pressure pulmonary circulation, so should stop spontaneously
• Patients with massive hemothorax (or persistent air leak) require surgery
• Oversew or staple the bleeding injury (not infrequently a bleeding intercostal artery)
• Tractotomy: Open the bullet trajectory, and staple from entrance to exit
• Lobectomy, wedge resection, or pneumonectomy
• Cross-clamp pulmonary vascular hilum if massive bleeding

Sternal Fractures

• Rare; usually due to seat belt or steering wheel
• Associated with severe underlying trauma to anterior chest
• Chest pain over sternum, crepitus, hematoma
• Diagnosis confirmed by lateral chest radiography
• CT to assess for associated injuries
• Usually treat conservatively

Blunt Cardiac Injury/Cardiac Contusion

• Can be a challenge to diagnose
  - But always should be considered
  - And index of suspicion depends on the mechanism of injury (broken steering wheel, etc.)
• There is no single diagnostic test, but start with electrocardiogram. If abnormal, then add on a troponin.
• Conservative management
  - Electrocardiogram/troponin at admission and at 8 hours: if normal, there is no concern
  - Abnormal electrocardiogram/troponin: cardiac monitor for 24 hours, troponins, echocardiogram
  - If heart failure or cardiogenic shock then get an echocardiogram

Pericardial Tamponade

• Beck’s triad: muffled heart sounds, distended neck veins, hypotension
• More common in stab wounds; because patients with gunshot wounds usually die
• Tamponade requires surgery
  - This is because just 50 mLs of blood in the pericardial sac can cause shock
  - Subxiphoid pericardial window for immediate diagnosis (in OR). If positive for blood, then the patient needs a sternotomy
  - Pericardiocentesis following trauma is no longer indicated; perform surgery instead

Aortic Injuries

• Rare but deadly (most die on scene)
• Blunt injuries may have initial stable vital signs but then deteriorate
• Suspect when CXR shows wide mediastinum; loss of aortic knob; depression of left mainstem bronchus; tracheal deviation (or nasogastric [NG] tube deviation); left pleural effusion, loss of paratracheal stripe; pleural apical cap; 1st or 2nd rib fractures or sternal fractures (Figure 2)
• However, as many as 20% of patients with aortic dissections have a “normal” CXR
  - Therefore, chest radiography does not rule out aortic dissection if suspicion is high
  - To be more sure, perform CT angiography, magnetic resonance angiography, aortography, or transesophageal echography
• Intimal aortic injuries are treated with antihypertensives or endovascular stenting
• Otherwise, it’s surgery (and prayer)

Tracheobronchial Injuries

• Rare but associated with high mortality
• Usually present with tension pneumothorax and hemoptyis
• Diagnosis confirmed with bronchoscopy
• If laceration is >30% of the circumference (or >3 cm), surgery is typical

Diaphragmatic Injury

• Typically from penetrating trauma
• 70% associated with other significant injuries (aortic tear, rib fracture, lung contusion, liver and spleen laceration)
• Left hemidiaphragm more common because the right is “protected” by the liver
• CXR is “within normal limits” in 50% of cases. Seeing the gastroscopy tube, or bowel contents, above the hemidiaphragm offers a clue
• CT may help but is not sensitive enough to definitively rule
• Clinical examination and suspicion are important to drive further investigations
• May need laparoscopy; lacerations are repaired surgically

Abdominal Injuries

• In penetrating trauma, the small bowel is more commonly injured
• Not all knife stabbings need a laparotomy; approximately half miss the abdominal vessels and viscera. Surgeons may choose conservative management (even with immediate OR access)
• In contrast, GSWs almost always need surgical exploration
• Indications for trauma laparotomy include
  - Hemodynamic instability
  - Peritonitis
  - Evisceration
  - Free air
• All hollow viscus injuries (stomach, small bowel, colon) require surgical repair
• In contrast, solid-organ injuries can be managed non-operatively as long as patients are hemodynamically stable and injuries are low grade

Small Bowel Injuries

• In penetrating trauma, small bowel is the most commonly injured organ
• In blunt trauma, beware of missed injury or delayed presentation
• Proximal jejunum and distal ileum are most commonly injured (because this is the transition between fixed and mobile bowel)
• Increased index of suspicion with:
  - Seatbelt or steering wheel sign (abdominal bruising from a lap belt or wheel)
  - Chance fracture
    - T12 to L2
    - Anterior vertebral body compression
    - Posterior transverse fracture

Figure 2. A, Chest radiograph showing signs of aortic dissection. B, Chest radiograph of the aortic dissection following aortic endograft repair. CXR = chest radiograph.
- Violent forward flexion
- Pancreatic injury
• Often recognized late; CT is not overly sensitive for small-bowel perforation
• If surgery is required, it can be
  - As simple as a suture repair
  - As complex as a significant bowel resection
• Watch for complications (intra-abdominal abscess, anastomotic leak and ileus)

Colon Trauma (see “Colon SINS” chapter)
• Similar to small-bowel trauma
• More common in penetrating trauma than in blunt trauma
• Can be missed or can present late
• Repair ranges from repair to resection to diversion

Liver and Spleen Trauma (see “Liver SINS” chapter)
• Manage conservatively if vital signs are stable
• Surgery for unstable patients
• May consider angioembolization for high-grade injuries with high-risk features such as contrast extravasation or pseudoaneurysm (Figures 3 and 4)
• There is insufficient evidence to support routine follow-up imaging.
• Ultrasonography or CT may be considered in order to lift an activity restriction, or for those patients at high risk for pseudoaneurysms
• Injury can be graded from I to VI (Tables 3 and 4)
  - Grades I and II are usually managed conservatively
  - Grades III to VI usually require radiological or surgical intervention

Pancreas Trauma (see “Pancreas SINS” chapter)
• Difficult to diagnose and tough to manage, as is everything regarding this organ
• Serum amylase/lipase not specific, but persistent elevation can indicate that further investigation or surveillance is required
• Focused assessment with sonography for trauma (FAST) is unreliable for pancreas. CT is the main modality of diagnosis
• Because missed injury is associated with great morbidity and mortality, maintain a high suspicion, especially if there is a concomitant vertebral fracture or a liver or duodenal injury
• If the main pancreatic duct is injured, resection is usually required. Otherwise, simple drainage usually suffices

Rectum and Anus Trauma
• Rare
• 80% are penetrating injuries; 15% from anal foreign bodies, and 1–2% following pelvic fractures
• Maintain a high level of suspicion with the following mechanisms and clinical examination results:
  - Transpelvic GSW
  - Penetrating trauma in lower abdomen, buttocks, or upper thighs
  - Transanal impalement

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury type</th>
<th>Description of Injury</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hematoma</td>
<td>Subcapsular, &lt;10% SA</td>
<td>Conservative</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Capsular tear, &lt;1 cm parenchyma depth</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Subcapsular, 10–50% SA, &lt;10 cm parenchyma</td>
<td>Conservative: if hemodynamically stable</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Capsular tear, 1–3 cm parenchyma, &lt;10 cm length</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Hematoma</td>
<td>Subcapsular, &gt;50% SA of parenchyma, &gt;10 cm parenchyma</td>
<td>Surgery if expanding hematoma or hemodynamic instability</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>&gt;3 cm parenchymal depth, &gt;10 cm length</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Hematoma</td>
<td>Ruptured intraparenchymal hematoma with active bleeding</td>
<td>Surgical</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>25–75% hepatic lobe, or 1–3 segments</td>
<td>Surgical</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>&gt;75% of hepatic lobe or &gt;3 segments in a single lobe or juxtahepatic venous injuries (i.e., retrohepatic vena cava/central major hepatic veins)</td>
<td>Surgical</td>
</tr>
<tr>
<td>VI</td>
<td>Vascular</td>
<td>Hepatic avulsion</td>
<td>Surgical</td>
</tr>
</tbody>
</table>

SA = surface area.
Pelvic fracture (2% have an associated rectal injury)
- Sexual assault
- Abnormal digital rectal examination (i.e., blood inside bowel or disruption to sphincters) (Involve your surgeon early in performing the examination; often done in the OR)

**Extremity Trauma**

- Stable patient
  - CT scan of abdomen and pelvis
  - Contrast blush: diagnostic/therapeutic angiography plus embolization

- Unstable patient
  - ABC’s
  - Rule out thoracic and abdominal sources of shock
  - Chest and pelvic radiology, CT, FAST, diagnostic peritoneal lavage
  - If still unstable, angiography
- Control of bleeding
  - Wrap sheet tightly around pelvis
  - External fixation
  - Arterial embolization
  - Open reduction internal fixation
- Open pelvic fractures
  - 5% of cases, 50% of mortality

**Table 4: Splenic Injuries**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury type</th>
<th>Description of Injury</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hematoma</td>
<td>Subcapsular, &lt;10% SA</td>
<td>Conservative</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Capsular tear, &lt;1 cm parenchyma depth</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Subcapsular, 10–50% SA</td>
<td>Conservative: if hemodynamically stable</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Capsular tear, 1–3 cm parenchyma</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Hematoma</td>
<td>Subcapsular, &gt;50% surface area or expanding, or intraparenchymal hematoma &gt;5 cm</td>
<td>Surgery if expanding hematoma or hemodynamic instability</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>&gt;3 cm parenchymal depth or involving trabecular vessels</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Hematoma</td>
<td>Laceration of segmental/hilar vessels with devascularization (&gt;25% of spleen)</td>
<td>Surgical</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Completely shattered spleen</td>
<td>Surgical</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>&gt;75% of hepatic lobe or &gt;3 segments in a single lobe or juxtageal vein injuries (i.e., retrohepatic vena cava/central major hepatic veins)</td>
<td>Surgical</td>
</tr>
<tr>
<td>VI</td>
<td>Vascular</td>
<td>Hilar vascular injury that devascularized spleen</td>
<td>Surgical</td>
</tr>
</tbody>
</table>

SA = surface area.

**Figure 3.** A, Computed tomography scan showing grade II liver injury conservatively treated. B, Computed tomography scan showing grade IV liver injury; complex laceration involving three segments of liver.
Figure 4. A, Computed tomography scan showing grade II splenic injury conservatively treated. B, Computed tomography scan showing grade III splenic injury treated by angiographic embolization. C, Computed tomography scan showing grade V splenic injuries surgically treated by splenectomy.

- External compression; ligation and packing of obvious bleedsers
- Anal and rectal lacerations require diverting colostomy
- Vaginal lacerations require débridement and repair
- Bladder injuries require repair or diversion via suprapubic cystostomy
- Long bone fracture
  - Frequent checks of pulse and pallor
  - Treatment options: traction, angiography, and surgery

**Trauma Adjuncts: Tubes and Tests**

- Bloodwork: Complete blood count with differential (CBCD), electrolytes, international normalized ratio (INR), partial thromboplastin time (PTT), arterial blood gases (ABGs), cross-match, pregnancy test, plus toxicology
- Imaging
  - C-spine, chest and pelvic radiography
  - Other x-ray imaging if stable, for bony injuries or to look for bullets
  - Most patients just have a trauma pan-scan (but only if stable)
    - Head; C-spine, chest, abdomen, pelvis
    - Must have CT with IV contrast to assess major vessels and solid organs
    - Aortic arch and T- and L-spines can be reformatted
  - Retrograde urethrography to rule out urethral (and bladder) injury
- Nasogastric tube and Foley catheter
  - Contraindications to NG tube
    - Facial fracture
    - Base of skull (in which case, use an oroantral tube instead)
- Contraindications to Foley
  - High-riding, boggy prostate
  - Perineal hematoma
  - Blood at the meatus
  - Open pelvic fracture into rectum or vagina
- The above findings suggest a urethral tear, in which case
  - Perform retrograde urethrography
  - Or perform a suprapubic catheter
- Focused assessment with sonography for trauma (FAST)
  - Rapid, noninvasive bedside ultrasonography to identify intra-abdominal or pericardial fluid
  - Indicated for patients with hypotensive abdominal trauma or for those too unstable for CT
- Look at the “four P’s” of free fluid
  - (1) Perihepatic (Morison pouch and suprahepatic area): probe at right midpost axillary line, eleventh intercostal space (ICS)
  - (2) Perisplenic: left postaxillary line, tenth ICS
  - (3) Pelvis (cul-de-sac, pouch of Douglas, rectovesicular pouch): midline, just superior to symphysis pubis
  - (4) Pericardium: probe to left of xiphisternum; angle-probe up and under the costal margin
- Maybe a fifth “P”: pleural space
  - Fluid between the lung, chest wall, and diaphragm/liver
  - Probe in the lower thorax, mid- to postaxillary line
- If positive FAST result and hemodynamic instability, perform laparotomy
- If negative FAST result, look for other sources
- Sensitivity 75% in expert hands; specificity 98%
- Competency requires at least 25 scans
- Diagnostic peritoneal lavage (DPL)
  - Rarely done since the advent of rapid CT
  - Indications
    - Hypotensive, unresponsive
    - No indication for immediate laparotomy
    - Too unstable to undergo CT, due to other injury or surgery
    - Indeterminate FAST
    - Unreliable physical examination (LOC, spinal cord injury)
  - Contradictions (and necessary preparations)
    - Need for immediate laparotomy
    - Relative: previous laparotomy, pregnancy, obesity
    - Insert NG and Foley before DPL
  - DPL-aspiration catheter is inserted towards the pelvis
    - Aspiration is attempted with a syringe
    - If no blood, then 1 L of warm 0.9% saline is infused
    - After a few minutes, this is drained and sent for analysis.
  - Positive DPL is defined as
    - >10 cc gross blood, or newspaper print cannot be read through the tubing
    - 100,000/mL red blood cells (5,000 in penetrating trauma)
    - 500/mL white blood cells
    - Bilirubin, amylase >20 U
    - Bacteria, food
- Very sensitive, but low specificity (high negative laparotomy), especially with pelvic fractures
- Injuries missed with DPL
  - Retroperitoneal, renal, pancreatic, and duodenal injury
  - Diaphragm injury
  - Minor bowel injuries
  - Extraperitoneal bladder
- Tetanus immunization
  - Depends on patient’s previous immunization status
    - If unknown, then it’s safer to give
  - To decrease the likelihood of tetanus, remove all devitalized tissue, and leave all dirty wounds open
Surgical Pearl 1: Chest Tube Placement

Equipment
- Chest tube tray (scalpel, Kelly or curved clamp, needle driver, suture, scissors); choose your size chest tube (typically 28-32 French-sized)
- Pleur-evac system

Procedure
- Prep and drape the area
- Make an incision along the upper border of the rib (to prevent injury to the neurovascular bundle)
- Using a curved clamp, develop the track by blunt dissection to spread the muscle tissue
- Angle the clamp just over the rib, and continue the dissection until the pleura is entered (often necessary to pop into the pleural space)
- Insert a finger into the pleural cavity to ensure the area is clear of adhesions
- Mount the chest tube on the clamp and place into the pleural cavity
- Connect the tube to the Pleur-evac and suture in place
- Take a chest x-ray to confirm placement and position

Refer to “Tube, Drains, and Ostomies SINS” for how to use the Pleur-evac system and remove the chest tube.

Surgical Pearl 2: Emergency Thoracotomy

Indications
- Penetrating thoracic injury
  - Traumatic arrest with previously witnessed cardiac activity (pre-hospital or in hospital)
  - Unresponsive hypotension (blood pressure [BP] <70 mm Hg)
- Blunt thoracic injury
  - Unresponsive hypotension (BP <70 mm Hg)
  - Rapid exsanguination from chest tube (>1,500 mL)

Contraindications
- Blunt injuries
  - Blunt thoracic injuries with no witnessed cardiac activity
  - Multiple blunt trauma
- Penetrating abdominal trauma without cardiac activity
- Nontraumatic cardiac arrest
- Severe head injury
- Improperly trained team
- Insufficient equipment

Equipment
- Retractors, scissors, forceps, scalpels
- Needle holder, curved artery forceps
- Vascular clamps, Crawford clamps
- Internal defibrillation paddles
- Skin stapler, sutures, surgical ties
- Protective equipment – eye glasses, face mask, gown, sterile gloves – to be worn by all staff

Procedure
- Anterolateral thoracotomy, fifth intercostal space: insert rib spreaders (inframammary fold can be used as a guide; remember to follow upper border of sixth rib to avoid the neuromuscular bundle)
- Reflect left lung anteriorly and superiorly
- Divide the inferior pulmonary ligament
- Widely open the pericardium (vertically anterior to the phrenic nerve) and deliver heart out of pericardium
- Occlude hole in heart (finger, Foley catheter, skin stapler)
- Clamp the aorta; +/- clamp hilum if necessary (or twist hilum for massive bleed)
- Perform internal cardiac massage. Use both cupped hands or one cupped hand to compress the heart against the sternum
- Defibrillate, using small internal paddles on either side of heart (15–30 J)

References
HIV Testing: Support for Routine Screening

Brett Edwards, BSc Pharm, Stephen Vaughan, MD, DTMH

Summary
This article discusses the recent evolution of human immunodeficiency virus (HIV) screening recommendations with significantly expanded role for routine HIV testing. After the Centre for Disease Control (CDC) released recommendations for routine screening in 2006, it was anticipated that the United States Preventive Services Task Force (USPSTF), a national body charged with providing evidence-based recommendations for preventive services, would follow shortly. However, they refrained, citing a lack of evidence at the time to make such a recommendation, and maintained a recommendation for risk-based screening. Following an analysis of recent literature, in 2013 the USPSTF finally made a recommendation for routine HIV screening on the grounds of new evidence. The recommendations are based on the clinical benefit, the failures of risk-based screening, cost-effectiveness data with reduction in HIV related morbidity/mortality, and lower rates of transmission. This article highlights some of the literature that accounted for the change in recommendations and provides a basic review of HIV testing techniques available to the internists and the recommendations for routine screening of patients.

Résumé
L’article examine l’évolution récente des recommandations sur le dépistage de l’infection par le VIH, notamment l’expansion de la détection systématique. À la parution des recommandations sur le dépistage systématique du Centre for Disease Control aux États-Unis en 2006, l’on s’attendait à ce que le Groupe de travail sur les services de prévention de ce pays, organisme chargé d’offrir des recommandations fondées sur des données probantes à propos des services de prévention, emboîte le pas rapidement. Le Groupe s’est abstenu sur le motif de l’absence de données probantes sur lesquelles fonder une telle recommandation et a maintenu sa recommandation de dépistage en fonction du risque d’exposition au virus. Après une analyse documentaire en 2013, le Groupe de travail a enfin recommandé le dépistage systématique au vu des nouvelles données probantes. Les recommandations se justifient par les avantages cliniques, les échecs du dépistage en fonction du risque, des données cout-efficacité illustrant la diminution de la morbidité et de la mortalité liées à l’infection par le VIH et la baisse des taux de transmission. L’article présente la documentation qui a inspiré ces nouvelles recommandations et passe en revue les techniques de dépistage du VIH à la disposition de l’interniste et les recommandations préconisant le dépistage systématique.
Recently, the United States Preventive Services Task Force (USPSTF) released a highly anticipated recommendation for routine HIV screening of patients at any interaction with health care, which is quite similar to the recommendation made by the Centre for Disease Control (CDC) in 2006. The USPSTF felt that, until recently, there was insufficient efficacy data to support such a practice. This paper provides a review for internists on the basics of human immunodeficiency virus (HIV) testing and highlights recent changes in evidence that have brought about a recommendation to test nearly all patients.

There are multiple techniques available to test for human immunodeficiency virus. The first-generation HIV test uses an enzyme immunoassay (EIA) to detect host IgG to viral lysate (crude proteins). Most tertiary centres now utilize third- and fourth-generation kits, which simultaneously detect IgM and IgG antibodies to recombinant protein antigens of HIV 1 and 2, or combined viral p24 antigen/HIV IgM/IgG antibody, respectively. Each method reports sensitivity and specificity >99% with diagnostic confirmation using the time-proven Western Blot method. Rapid detection kits are available, using blood or oral secretions and providing results within 30 minutes (compared to 1–2 days for conventional tests). These kits deliver quick results in an emergent setting (e.g. index case testing prior to initiating post-exposure prophylaxis) and to reduce loss to follow-up in potentially non-compliant patients. Nucleic acid tests determine the presence of viral genetic material, negating the required presence of host antibodies. The benefit is the ability to detect acute HIV infection in the “window-period” of infection, which is 7–10 days post-exposure and prior to seroconversion.

Time to detection of HIV infection continues to decrease, but physicians must be cognizant of potential false negatives. Third- and fourth-generation tests have shortened time to positivity from 8 weeks post-exposure required in the first-generation tests to 2–3 weeks. The shorter period in fourth-generation tests is due to detection of viral p24 antigen prior to antibody seroconversion. Following detection, diagnosis requires confirmation with Western Blot or immunofluorescent assay (IFA), which can take an additional 2 days upwards to 3 weeks. Depending on time since the predicted exposure, continued risky behaviour, and the sensitivity of the test kit used, the clinicians must consider the possibility of false negative results. In suspected acute infection with negative initial testing, RNA PCR and serology can be rechecked in 2–4 weeks and 3–6 months, respectively. In 2006, the CDC released recommendations for routine testing of all patients aged 13 to 64 years, regardless of risk factors. At that point, the USPSTF had refrained from making similar recommendations due to a lack of perceived evidence supporting the strategy in addition to elevated risks of false positives, and rather, maintained a risk-based screening guideline. In 2013, the USPSTF finally released updated recommendations to: 1) screen all pregnant women for HIV including those who present untested in labour, and 2) screen for HIV, in everyone aged 15 to 65 years, as well as those outside this age range who present at increased risk. Risk status must be individualized, but increased risk may include: men who have sex with men, active injection drug users, those who have had unprotected vaginal and/or anal intercourse, HIV-infected sexual partners, bisexual individuals, persons exchanging sex for drugs or money, and those seeking testing for sexually transmitted infections. Universal screening is recommended in any setting where the prevalence of HIV-positive status is ≥ 0.1%. Evidence to guide intervals is lacking, but it has been suggested to screen all patients in the above age-range at least once and those at high risk or in a high-prevalence setting (≥1%) annually.

Universal screening is not without potential harm. Early HIV detection leads to earlier initiation of lifelong highly active antiretroviral therapy (HAART) with more opportunity to develop adverse events. HAART has been associated with cardiovascular disease due to metabolic issues linked with the medications, as well as the potential for increased bone, liver, and renal disease. Notably, untreated HIV also risks these comorbidities. Additionally, it leads to earlier exposure to negative psychological effects from having a chronic infection associated with stigmatization. True positive HIV diagnosis has been associated with anxiety and depression. The contribution of false positive results, which are infrequent, to these comorbidities is less well established. One must also factor in the potential burden of universal screening that would be placed particularly on primary care centres. However, the USPSTF recommendations received a “Grade A” recommendation, meaning a “high certainty that the net benefit is substantial.”

Multiple factors have contributed to this updated routine screening recommendation to substantiate the net benefit, including the high diagnostic accuracy of current HIV tests, cost-benefit analysis, and demonstrated improvement in outcomes. Additionally, the update recognizes a changing HIV-positive demographic causing issues with perception of what constitutes high-risk status, as well as the success of other routine HIV screening programs in pregnancy and blood-donation clinics. Routine screening reduces the number of HIV-positive patients missed due to absent risk factor reporting and aims to reduce the stigma associated with risk-
based screening. Both guidelines now endorse a practice of “opt-out” screening. Specifically, informed consent is required with opportunities for patients to ask questions. Then, as part of their general medical care, patients will receive an HIV screen unless they decline or opt-out. This contrasts with previous recommendations that suggest specialized, written consent must be received from patients choosing to opt-in for testing. Opt-out practices consistently perform more HIV screening tests than those using opt-in principles. Positive test results should be confidentially communicated to the patient by a health care professional, but remain accessible to others caring for the patient.

Universal testing is a cost-effective strategy, even in settings of low prevalence. Computational models demonstrate that routine screening with one lifetime test in low-risk patients and annual testing in high-risk patients costs $22,382 per quality adjusted life years (QALY). Further gains in QALY were possible if screening was linked with earlier initiation of antiretroviral therapy (ART). This cost-effectiveness of routine screening puts it on par with other currently recommended chronic disease screening programs, such as hypertension and breast cancer. A reduction in risky behaviour is argued to be imperative to end an epidemic in the US and is a benefit, as demonstrated with routine testing. However, HIV screening meets an acceptable threshold of cost-effectiveness even before factoring in a reduction in sexual transmission.

Early detection makes a difference on HIV outcomes, yet it has been estimated that about one-third of patients receive a late diagnosis. Previously, the USPSTF failed to find evidence of clinical benefit with initiating earlier antiretroviral therapy ART (CD4 ≥ 200 x 10^6 cells/L). Multiple studies now exist noting morbidity and mortality benefit with early ART, often in the asymptomatic patient. In particular, a high-quality randomized trial showed a reduction in serious AIDS–related events, including death, with early treatment (CD4 350-550 x 10^6 cells/L). This same study found that in couples with discordant HIV status, those who received earlier treatment had lower rates of transmission than those who initiated ART at CD4 ≤ 200 x 10^6 cells/L.

As mentioned, further benefit to early detection of infection stems from the conclusion that individuals aware of their HIV-positive status reduce high-risk behaviours. These include unprotected intercourse, injection drug use, and sex in exchange for drugs or money. Some question whether universal screening must be linked to counselling to reap these benefits. The CDC argues that directing people diagnosed with HIV to prevention and care services is essential. Conversely, the benefit of tying counselling to screening is less clear because it may limit the effectiveness and compliance in HIV-negative patients, thus reducing testing numbers. Subsequently, it is not recommended. Rather, counselling is strongly recommended when screening high-risk individuals and in sexually transmitted infection (STI) clinics where risky behaviours are assessed routinely, as a counselling and prevention strategy for all sexually transmitted infection clinics is a beneficial practice. Combining reduction in high-risk behaviour to curb viral spread with noted morbidity/mortality benefit simply by earlier detection makes routine screening for HIV a necessary inclusion into practice.

Routine HIV screening is not a practice of “testing because we can,” but rather a practice with clear clinical and cost benefit. Recent references have supported this practice and enabled the USPSTF to recommend routine screening, which includes screening all patients aged 15 to 65 years upon contact with the health care system and annually in those at increased risk. This is similar to recommendations outlined by the CDC in 2006. There are a variety of testing methods available to screen for HIV. Nucleic acid tests offer the earliest detection at 7–10 days but are costly. Most tertiary centres use third or fourth generation screens, which can detect the virus 2–3 weeks post-infection and are available in conventional and rapid test kits. Following diagnostic confirmation with Western Blot or IFA, most tests are >99% sensitive and specific for HIV, making them a reliable screening protocol that is equivalent to other chronic disease screening programs. The benefits of early treatment outweigh any negative consequences; therefore, routine testing is justified in nearly all patients.

Helpful resource for clinicians interested in further information:
HIV InSite Knowledge Base:
http://hivinsite.ucsf.edu/ - click on ‘Knowledge Base’
### Table 1. Common Tests Used for HIV Detection

<table>
<thead>
<tr>
<th>Test</th>
<th>Mechanism of detection</th>
<th>Post-infection time to positivity</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Gen</td>
<td>EIA detecting IgG to viral lysate</td>
<td>6-8 weeks</td>
<td>Time proven</td>
<td>Cannot detect viral antigen; Relatively poor sensitivity and specificity; Time to positivity</td>
</tr>
<tr>
<td>2nd Gen</td>
<td>EIA detecting IgG to recombinant viral antigen</td>
<td>5 weeks</td>
<td>Time proven; Improved specificity</td>
<td>Cannot detect viral antigen; Time to positivity</td>
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<tr>
<td>2nd Gen</td>
<td>Sandwich EIA to detect IgM and IgG</td>
<td>3 weeks</td>
<td>Earlier detection of antibodies (IgM) to both HIV 1 and 2</td>
<td>Cannot detect viral antigen</td>
</tr>
<tr>
<td>4th Gen</td>
<td>Detect IgM/IgG and/or viral p24 antigen</td>
<td>2 weeks</td>
<td>Can detect prior to seroconversion; more timely</td>
<td>May miss acute infection</td>
</tr>
<tr>
<td>WB</td>
<td>Detecting IgG to HIV lysate</td>
<td>5 weeks</td>
<td>Reliable; Time-proven; Specificity; Confirmatory test</td>
<td>Cost; Time; Time to positivity; False (-)</td>
</tr>
<tr>
<td>IFA</td>
<td>Fluorescent-tagged antihuman antibodies detect HIV antibody</td>
<td>Days</td>
<td>Specificity; May clarify indeterminate WB results</td>
<td>User dependent; Time; Cost</td>
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<tr>
<td>NAAT</td>
<td>Amplify HIV DNA or RNA</td>
<td>7–10 days</td>
<td>Earliest detection; Can detect acute infection</td>
<td>Cost, time, skill, 3-5% false (-) in established infection</td>
</tr>
<tr>
<td>Rapid Tests</td>
<td>Use saliva, blood, or serum to detect IgM/IgG to HIV</td>
<td>~3 weeks</td>
<td>Reduced loss to follow-up; Possible home use</td>
<td>Possible home use; false (-)</td>
</tr>
</tbody>
</table>


### References

Effect of an Intervention to Improve Team Coordination on Patients Who are Likely to be Discharged on General Internal Medicine

Lina Pham, BA, Teri Arany, RN, William Coke, MD, Vivian Lo, MASc, Robert C. Wu, MD

Summary
Effective discharge planning is important to ensuring a high quality of patient care and operational efficiency. The general internal medicine (GIM) environment is very complex and fluid, with multiple health professions providing care for patients. This makes coordination of discharges difficult, even with structured daily interprofessional rounds.

The purpose of this case-control study was to evaluate a discharge notification form that predicts next-day discharges. The main measures of the study, which took place in GIM wards at two academic teaching hospitals, were the completion and accuracy of the discharge forms, length of stay, discharge times, post-discharge admissions, and emergency department visits.

Seventy-six of 200 patients studied had information completed on the discharge notification form. The overall effect appeared to move discharges earlier in the day, while having no effect on length of stay. Patients whose information was completed on the discharge notification form were less likely to have an emergency department visit within 30 days post-discharge.

The use of a discharge notification form appears to move discharges earlier in the day, without increasing length of stay. Further refinement and evaluation is necessary to increase usage and assess the impact on outcomes of care.

Résumé
La planification des sorties efficace est très importante dans la prestation de soins de santé de grande qualité et dans l’efficience opérationnelle. L’environnement de médecine interne générale est très complexe, marqué par un flux constant d’activités et la participation de plusieurs disciplines de la santé à la prestation des soins. Dans un tel contexte, la coordination des sorties demeure difficile en dépit des tournées interprofessionnelles structurées quotidiennes.

L’objectif de l’étude cas témoins consistait à évaluer un formulaire d’avis de sortie qui indique les sorties du lendemain. Les principaux paramètres évalués dans le cadre de cette étude qui s’est déroulée aux unités de médecine interne générale de deux hôpitaux universitaires sont l’utilisation du formulaire et l’exacitude des renseignements qui y sont indiqués, la durée de l’hospitalisation, le moment des sorties, les admissions et les visites aux urgences après les sorties.

L’avis de sortie renfermait de l’information sur 76 des 200 patients étudiés. Prévoir les sorties plus tôt dans la journée semble être l’effet général de l’avis de sortie, qui n’a pas d’incidence par ailleurs sur la durée de l’hospitalisation. Les patients pour lesquels les renseignements paraissaient sur l’avis de sortie ont été moins enclins que les autres à se rendre aux urgences dans les 30 jours du congé.

L’utilisation d’un formulaire d’avis de sortie a pour effet, semble-t-il, de faire sortir les patients plus tôt dans la journée sans prolonger l’hospitalisation. Nous recommandons de peaufiner le formulaire et d’approfondir l’évaluation pour favoriser l’usage du formulaire et déterminer son impact sur les résultats des soins.
Introduction

Effective discharge planning is critical to the efficiency of hospital operations. Unfortunately, hospitals continuously struggle with delayed discharges, resulting in overcrowded emergency departments. These operational inefficiencies create bottlenecks that affect the flow of incoming patients and decrease the quality of care patients receive. Often, the delays arise due to poor care coordination at the time of hospital discharge. In many cases, health care teams are not aware of the potential discharges and the barriers preventing discharge. Ultimately, this creates confusion, delays, and poor patient flow and care both in and out of the hospital. Health care providers and stakeholders recommend a standardized, policy-driven discharge protocol that can improve effective discharge planning.

These issues are probably most inherent within services such as general internal medicine, where there is a high variability in diagnoses and a high amount of comorbidities seen among patients. The ability to discharge patients on a specific day is based on a series of events that are often difficult to predict, such as improvements in patient status or obtaining a procedure or investigation with reassuring results. The medical team is often the first to learn about changes in the discharge status of patients, but communication to the rest of the care team is often poor. Unfortunately, due to financial constraints, many hospitals are unable to have a coordinator or discharge planner to actively manage the process and coordinate care. A potential solution is to improve the communication regarding likely discharges. Our study objective was to evaluate and measure the effect of a tool in communicating likely discharges among the interprofessional teams.

Methods

Research Question: Does an intervention to improve the timely notification of potential discharges for the next day improve operational efficiency?

Design: A retrospective observational study of two general internal medicine sites—one with the intervention and one without (control).

Setting: The study was conducted at the Toronto Western Hospital (intervention) and Toronto General Hospital (control) on general internal medicine (GIM) wards. Each hospital is an academic teaching centre with four clinical teaching teams and a hospitalist team within their GIM divisions. The clinical teaching teams have an attending, a senior medical resident, junior medical residents, and medical students. The hospitalist teams are composed of one attending and two or three clinical fellows. Interprofessional ward rounds occur each weekday morning at both sites, and potential discharges are discussed at this time. The study was approved by the Research Ethics Board of the University Health Network.

Intervention: The tool—designed and developed by authors TA and WC—was iteratively refined at the Toronto Western Hospital and has been called the Patient Discharge Notification Form (PDNF) (Figure 1). The PDNF is a paper-based form

![GIM Discharge Notice Form](image)

Figure 1. Patient Discharge Notification Form
used for the purpose of triaging confirmed, probable, and possible discharges for upcoming patients. The physician completes the information on the form for each patient who was likely to be discharged. This information includes patient identifiers, likelihood of discharge, whether home services are required, and factors limiting the discharge. For patients whose discharges were not confirmed, the expectation was that the physician would enter the factors limiting discharge. Once complete, the information was collected and distributed to other clinicians, including nurse managers and patient flow coordinators. The purpose of the PDNF is to address barriers that may prohibit next-day discharge and to further facilitate ongoing discussion and action in ensuring effective, safe, and timely patient discharge. This tool was designed to overcome the gap in knowledge experienced by the medical care team about discharges for the next day. Although all patient discharges are discussed at care rounds in the morning, it was felt that having another point of communication later in the day would be beneficial, given the rapidly evolving nature of patient care. As well, the discharge form is meant to act as a checklist for physicians to make sure crucial pieces of the discharge are addressed, including informing the patient and family and arranging home services. The overall goal is that the PDNF would ultimately improve operational efficiency, reduce bed blocking, and reduce patient length of stay.

**Data Collection:** All patient discharge notification forms were collected. From both sites, 200 patients were randomly selected from all discharged GIM patients. These included patients who were discharged home or to another facility, patients who died, and patients who signed out against medical advice. All randomized patients from the Toronto Western Hospital were then screened from the collected PDNFs to see if there was any corresponding information on the patient.

**Analysis:** Descriptive statistics for the intervention site included 1) completion and accuracy rate of the PDNF, 2) discharge times for patients with PDNFs completed and those without PDNFs completed, 3) PDNF completion rate by different teams, and 4) PDNF completion rate for patients on GIM wards and those who were bed-spaced. Descriptive statistics included the following comparisons between the intervention site and the control site: average length of stay, average discharge time of day, and how PDNF completion affected patient readmission and emergency department visit averages at 30, 60, and 90 days post-discharge. Chi-square tests were calculated for categorical variables.

**Results**

Patient admissions were randomly selected from October 1, 2012, to December 31, 2012. During this time, there were 813 discharges at Toronto Western Hospital and 1070 discharges at Toronto General Hospital.

**Completion and Accuracy of Information**

Of 200 patients discharged at the intervention site, information on 76 (38%) patients on the associated PDNFs was available. Of the 76 patients with information listed, 26 PDNFs (34.2%) were completed in full, while the rest had missing data, including 29 (38.2%) who were missing estimated discharge time, 32 (42.1%) who were missing discharge mode of transportation, and 20 (26.3%) who were missing whether the patient or family was aware. In the section where a clinician would write any outstanding issues preventing the patient’s discharge, 66.6% (30 of 45 possible or probable discharges) contained information. The outstanding issues could be categorized into areas relating to outstanding investigations (22.2%), availability of home care services (16.6%), availability of rehabilitation (4.4%), and other items, such as family concerns, clinical status of the patient (i.e., improvement of delirium), and housing placement issues (24.4%).

With respect to discharge times, patients who had their PDNF information completed were more likely to be discharged earlier (40.8% before 1PM), compared to those who did not (33.0% before 1PM) (Table 1). When patients were listed in the PDNF, the information was accurate in predicting discharges. For those listed as “confirmed” next-day discharges, 96.8% were discharged the next day. For those listed as “probable” and “possible,” 90% and 93.3% were discharged the next day, respectively (Table 2).

When the PDNF forms were broken down across the five different clinical teams, the completion rates ranged from 30% to 50%. PDNFs were more likely to be completed for patients who were on the GIM ward, compared to off-service wards (43% vs. 32%, respectively).

**Toronto Western Hospital vs. Toronto General Hospital**

The length of stay between both intervention and control hospital sites was the same, at 6.4 days for the 200 patients studied. In terms of actual discharge times, there was a considerable difference between both sites. Overall, the intervention site had earlier discharge times, most notably in the 1–3PM time bracket (13% difference; \( P = 0.002 \)). (Table 1) There was no significant difference between patients at the intervention site and control site with respect to readmission or subsequent ED visits. There was also no difference in readmission between patients who had a completed PDNF and those who did not. However, there was a difference in...
the rate of ED visits within 30 days between those who had PDNF information completed and those who did not (9.2% vs. 21.0%; \( P = 0.03 \)) (Table 3).

**Discussion**

We have presented an evaluation of an intervention to improve team coordination around patients who were likely to be discharged. For the 38% of patients who had information entered, the information was highly accurate in predicting discharges. The effect of the intervention appeared to shift the time of discharges to earlier in the day, compared to the site that did not have the intervention. Also, patients who had entered information were less likely to have an ED visit within 30 days post-discharge.

Although there are discharge planning tools described in the literature, they are typically aimed at transitional care planning for patients and do not describe effective communication among health care professionals around upcoming potential discharges.9 Most literature, toolkits, and resources emphasize the necessity of successful communication among health care teams but fail to provide a clear method on how to accomplish this. Most discharge literature focuses on either failed discharges due to insufficient communication between inpatient and outpatient settings, ineffective care transitions, or other patient-related issues.10 There is limited literature on the evaluation of specific discharge planning tools for interprofessional use in a hospital setting. Our communication tool provides a solid foundation in facilitating ongoing and daily discussions among health care teams to provide effective and meaningful discharge indicators that may prohibit a
Improving team coordination for discharges

A notification system to improve coordination of care was accurate and might have moved discharges to occurring earlier in the day. This may translate to improved efficiency. Further refinement and study are necessary to improve the notification form and the adoption rate.

Acknowledgements
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References
Physical Activity Patterns Among Resident and Staff Physicians in Hamilton Teaching Hospitals

Oren Steen, MD, Ally P.H. Prebtani, MD

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Summary
Objective: This study aimed to evaluate patterns of, and barriers to, physical activity between resident and staff physicians in Hamilton teaching hospitals.
Methods: A total of 300 physicians were enrolled in this cross-sectional study that involved an online questionnaire containing 34 questions.
Results: The average participant reported 164 minutes per week of moderate to strenuous physical activity. There were no significant differences between resident and staff physicians (154 vs. 185 minutes per week; \( P = 0.15 \)), between men and women (177 vs. 155 minutes per week; \( P = 0.31 \)), among the various specialties (\( P = 0.54 \)), by number of children (\( P = 0.63 \)), or by exercise counselling practices (\( P = 0.75 \)). Within the age categories, those aged 35 to 44 years exercised significantly less than the group aged 45 to 54 years (110 vs. 231 minutes per week; \( P = 0.01 \)). The most commonly cited barriers to physical activity included feeling too tired to exercise after work, the time required for exercise, family responsibilities, and unfavourable weather conditions.
Conclusion: The average physician who responded to our survey reported physical activity patterns meeting current Canadian Society for Exercise Physiology (CSEP) recommendations regarding physical activity. Numerous barriers to exercise have been cited. More efforts are needed to minimize these barriers, implement strategies for increasing physical activity, and better promote physician health and wellness.

Résumé
La présente étude a pour but d’évaluer le degré et les modalités d’activité physique des résidents et des médecins en poste dans les hôpitaux universitaires de Hamilton, ainsi que les obstacles à l’activité physique. Cette étude transversale a été menée auprès de 300 médecins devant remplir un questionnaire en ligne (34 questions). Elle constate que l’activité physique dont font état les participants est conforme en général aux recommandations de la Société canadienne de physiologie de l’exercice. Les participants ont mentionné de nombreux obstacles entravant l’activité physique. Des initiatives devront être entreprises pour surmonter ces obstacles, mettre en œuvre des stratégies d’augmentation de l’activité physique et mieux promouvoir la santé et le bien-être du médecin.
Introduction
Over the last number of decades, obesity prevalence has increased in Canada. Between 1985 and 2011, the prevalence of adult obesity in Canada rose from 6.1% to 18.3%. The consequences have posed a significant burden on our health care system. For instance, the prevalence of metabolic syndrome was found to be 19.1%, with abdominal obesity being the most common component of the syndrome. Although medications are effective in treating cardiovascular risk factors, lifestyle interventions as a first-line approach are often overlooked.

Regular physical activity is an important component in maintaining a healthy body weight. The Canadian Society for Exercise Physiology (CSEP) recommends at least 150 minutes per week of moderate to strenuous intensity aerobic activity (or 75 minutes of strenuous activity) for optimal health. Physicians tend to have numerous professional and personal commitments. Consequently, their personal health and well-being are frequently neglected. Increasing emphasis is now being directed towards physician health. Most of the research pertaining to the latter has focused on work-related stress and burnout, mental health, and substance abuse. Less research has been conducted examining lifestyle habits and preventive health measures among physicians.

The 2007 Physician Health Survey is the largest Canadian study to date focusing on physician health. It found that physicians exercised on average 4.7 hours per week, 58% of which was of moderate or strenuous intensity. They therefore averaged 164 minutes per week of moderate to strenuous exercise. This study aimed to evaluate how Hamilton resident and staff physicians measured up to the national standard. Barriers to physical activity were also explored, something that has not been previously studied among physicians.

Subjects and Methods
Study Population and Data Collection
This cross-sectional study was conducted between February 22, 2013 and April 15, 2013. All postgraduate residents and staff physicians affiliated with McMaster University were invited by email to participate in the study. A reminder email was sent three weeks after the initial invitation.

Data on demographics, frequency and duration of physical activity (for mild, moderate, and strenuous activity), barriers to physical activity, and beliefs regarding the importance of physical activity were collected anonymously using SurveyMonkey®, a web-based survey tool.

Ethics approval was obtained from the Hamilton Integrated Research Ethics Board. Informed online consent was obtained from all subjects.

Questionnaire
Our survey included 34 questions. A copy of the survey can be found in the online appendix. The questionnaire included many of the relevant survey questions used in the National Physician Health Survey by Frank and Segura. Their survey was created with input from various physicians’ associations. A vast number of these questions were derived from the Canadian Community Health Survey, the National Survey of the Work and Health of Nurses, and the Behavioural Risk Factor Surveillance system, so that various comparisons can be made. Many of the questions pertaining to physical activity barriers derive from the Exercise Benefits/Barriers Scale developed by Sechrist and colleagues.

Statistical Analysis
Student’s t test was used to evaluate differences in moderate to strenuous physical activity (described in questions #14 and #16 in the online appendix) between resident and staff physicians and between male and female sex. One-way analysis of variance (ANOVA) was performed to assess for differences in physical activity among specialties as well as age categories. Categories with sample sizes less than five were excluded from the analysis. A P value of <0.05 was considered statistically significant. Tukey’s post-hoc test was used when the ANOVA was statistically significant. Fisher’s exact test was used to compare differences in the prevalence of overweight and obesity between male and female sex. Statistical analyses were performed with Statistical Package for the Social Sciences version 20.0 software (SPSS Inc.).

Results
Demographic Data
A total of 300 physicians were recruited into the study. Of 800 postgraduate residents, 204 participated in the study, for a response rate of 26%. A total of 96 staff physicians took part in the study. Because staff email invitations went channelled through various departments, we were unable to determine their exact response rate.

The average physician responding to our survey reported 164 minutes per week of moderate to strenuous physical activity. Demographic information is summarized in Table 1.

Amount of Physical Activity
The distribution of moderate to strenuous physical activity patterns can be seen in Figure 1. There were no significant differences between resident and staff physicians (154 vs. 185 minutes per week; P = 0.15), between men and women (177 vs. 155 minutes per week; P = 0.31), among the various specialties (P = 0.54), by number of children (P = 0.63), or
by exercise counselling practices ($P = 0.75$). Physical activity varied significantly by age group, and when analyzed with Tukey’s post-hoc test, the group aged 35 to 44 years and 45 to 54 years was significantly different (110 vs. 231 minutes per week; $P = 0.01$). Overall, 50.7% of physicians reported over 150 minutes per week of moderate to strenuous physical activity. Of these, 12.0% exercised 150 to 160 minutes per week.

**Barriers to Physical Activity**

Barriers to physical activity are summarized in Table 2. The most commonly cited barriers included feeling too tired to exercise after work, the time required for exercise, family responsibilities, and unfavourable weather conditions. The least commonly cited barriers were injury and embarrassment about exercising.

**Attitudes Regarding Importance of Physical Activity**

A total of 35.6% of respondents reported they usually or always talk to their patients about physical activity, while 45.9% sometimes do, and 18.5% never or rarely do. Fifty-five percent of subjects value physical activity “very much,” with regards to their general well-being.

**Strategies to Increase Physical Activity**

Various strategies employed for increasing physical activity are outlined in Table 3. Those reported most frequently include taking the stairs rather than the elevator, doing regular vigorous housework, parking as far from the entrance as possible, and walking, jogging, or cycling to work. Among the other strategies mentioned were employing personal trainers, working out at home, varying exercise routines, walking the dog, exercising early in the morning before work, and exercising with friends.

**Other Data**

The prevalence of overweight and obesity was significantly higher in men compared to women (40.5% vs. 21.0%; $P < 0.05$). Less than half (44.3%) of respondents had active gym memberships. However, most subjects (71.9%) felt they would be more likely to exercise if their hospital had gym and shower facilities. A total of 94.3% of subjects reported being in good general health, although 71.5% felt they do not get enough physical activity.

**Discussion**

The average physician responding to our questionnaire reported 164 minutes per week of moderate to strenuous physical activity, which was in line with the 2007 National Physician Health Survey conducted by Frank and Segura.6

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Table 1 Demographic data (n = 300)

<table>
<thead>
<tr>
<th>Appointment</th>
<th>n</th>
<th>% of respondents</th>
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<tbody>
<tr>
<td>Resident</td>
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<tr>
<td>Staff</td>
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<td>25.1-29.9</td>
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<tr>
<td>≥30</td>
<td>8</td>
<td>2.9</td>
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</table>

Figure 1. Histogram showing the distribution of moderate to strenuous physical activity patterns
Interestingly, there were no significant differences in amount of physical activity among the various specialties. Those specialties with longer work hours might have been expected to exercise less than those with lighter work schedules. For instance, in a study by Kumagai and Ogura, longer work hours in middle-aged Japanese workers had negative effects on regular physical activity participation. Another notable finding was that participants aged 35 to 44 years exercised less than half that of those aged 45 to 54 years. One might postulate that those aged 35 to 44 years were preoccupied with raising a young family and thus more limited by family commitments than their 45- to 54-year-old counterparts.

Time appeared to be a common barrier to physical activity, not surprisingly. This was also found to be the case in an Australian adult survey by Booth and colleagues, with lack of motivation and childcare responsibilities following suit. Disappointingly, just over one-third of physicians regularly counselled their patients on physical activity. For many conditions, lifestyle recommendations should be discussed before initiating (or concurrent with) pharmacological treatment. Contrary to the study by Frank and others, this study did not find that physicians who regularly counselled their patients on exercise were most likely to be physically active themselves.

The reported rates of overweight and obesity were lower in this study, compared to the 2007 Physician Health Survey (29.3% vs. 45%). As well, the rates in men were almost double that of women (40.5% vs. 21.0%). This proportion was similar in the 2007 Physician Health Survey, where 55% of male physicians reported being either overweight or obese, compared to 25% of female physicians.

A total of 71.5% of subjects felt they do not get enough physical activity. A similar percentage of respondents felt they would be more likely to exercise if their hospital had gym and shower facilities. Creating a hospital-based gym is an undertaking worth further exploring and one that other hospitals have accomplished in recent years.

Limitations
Some limitations warrant consideration. Our data relied on self-reporting, which limits its reliability. The resident response rate of 26% was suboptimal. Unfortunately, we were unable to determine how many staff physicians received the email invitation for the survey, as it was streamlined through numerous departments. The small sample size served to decrease the study’s power. It is also conceivable that there was selection bias, as those with a stronger interest in physical activity might have been more likely to complete the survey.

### Table 2 Barriers to physical activity

<table>
<thead>
<tr>
<th>Statement</th>
<th>% of respondents</th>
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<tbody>
<tr>
<td>I feel too tired to exercise after work</td>
<td>70.4%</td>
</tr>
<tr>
<td>Exercising takes up too much of my time</td>
<td>45.7%</td>
</tr>
<tr>
<td>Exercise takes too much from my family responsibilities</td>
<td>33.8%</td>
</tr>
<tr>
<td>I find it difficult to exercise due to unfavourable weather conditions</td>
<td>31.9%</td>
</tr>
<tr>
<td>Exercise facilities do not have convenient schedules for me</td>
<td>30.5%</td>
</tr>
<tr>
<td>Exercise tires me</td>
<td>25.5%</td>
</tr>
<tr>
<td>Exercise is hard work for me</td>
<td>24.0%</td>
</tr>
<tr>
<td>I find exercise boring</td>
<td>22.1%</td>
</tr>
<tr>
<td>Places for me to exercise are too far away</td>
<td>21.7%</td>
</tr>
<tr>
<td>I lack a partner with whom to exercise</td>
<td>17.8%</td>
</tr>
<tr>
<td>There are too few places for me to exercise</td>
<td>15.3%</td>
</tr>
<tr>
<td>I lack exercise equipment</td>
<td>15.0%</td>
</tr>
<tr>
<td>It costs too much money to exercise</td>
<td>12.1%</td>
</tr>
<tr>
<td>My family members do not encourage me to exercise</td>
<td>9.3%</td>
</tr>
<tr>
<td>My spouse (or significant other) does not encourage exercising</td>
<td>8.6%</td>
</tr>
<tr>
<td>I am unable to exercise due to injury</td>
<td>8.2%</td>
</tr>
<tr>
<td>I am too embarrassed to exercise</td>
<td>5.0%</td>
</tr>
<tr>
<td>I think people in exercise clothes look funny</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

### Table 3 Strategies used to increase physical activity

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Percent of respondents employing strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I generally take the stairs rather than the elevator</td>
<td>94.3%</td>
</tr>
<tr>
<td>I do regular vigorous housework</td>
<td>25.5%</td>
</tr>
<tr>
<td>I park as far from the front door as possible</td>
<td>22.1%</td>
</tr>
<tr>
<td>I walk/jog/cycle to work</td>
<td>22.1%</td>
</tr>
<tr>
<td>I do gardening</td>
<td>18.6%</td>
</tr>
<tr>
<td>I break up my exercise sessions into several short blocks</td>
<td>16.0%</td>
</tr>
<tr>
<td>I am in a walking/jogging/cycling group</td>
<td>9.5%</td>
</tr>
<tr>
<td>I take a brisk walk at lunchtime</td>
<td>6.5%</td>
</tr>
<tr>
<td>I am too embarrassed to exercise</td>
<td>5.0%</td>
</tr>
<tr>
<td>I think people in exercise clothes look funny</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

### Table 2 Barriers to physical activity

### Table 3 Strategies used to increase physical activity
the questionnaire. Finally, as with any observational study, multiple confounders may have impacted the results.

**Conclusion**
On average, the physicians responding to our questionnaire reported 164 minutes per week of physical activity. Moreover, their exercise patterns are similar to those reported in the 2007 Physician Health Survey. Those in the group aged 35 to 44 years exercised significantly less than their 45- to 54-year-old counterparts. Otherwise, no significant between-group differences were found. However, because these results represent a small sample of McMaster University physicians, they may not be generalizable to the population as a whole.

Numerous barriers to exercise have been cited. More efforts are needed to minimize these barriers, implement strategies for increasing physical activity, and better promote physician health and wellness.

**Acknowledgements:** The authors acknowledge Dr. Zubin Punthakee for critically reviewing the manuscript, as well as Dr. Erica Frank for providing a copy of the “Health Practices of Canadian Physicians” survey used in the 2007 Physician Health Study.

**References**
POSITION SUMMARY:
A community based (must maintain office practice) general internal medicine specialist with a focused interest in diabetes to assist with the expansion of the Diabetic Program as well as participating in cardiac care with potential involvement with the community Heart Function Program.

PRIMARY RESPONSIBILITIES INCLUDE: Daily rounds on patients including facilitation of timely discharge, physician to physician transfer must take place for all patients being discharged from ICU, available to participate in hospital committees pertaining to specialty, and participate in teaching rounds.

ON-CALL: Collaborative participation for on-call coverage will be shared with the OSMH Department of Medicine members with the potential for occasional support for Critical Care

RESOURCES: Available outpatient clinics include Diabetes Clinic, Stress Testing and Cardiolite Testing, ECG and Holte Monitoring and outpatient clinic for minor procedures.

COMPENSATION: Fee for service, HOCC for on-call, in hospital cardio diagnostic procedures are billed by hospital and then paid monthly.

QUALIFICATIONS: Applicant must be a licensed physician in the Province of Ontario and Fellow of the Royal College Physicians and Surgeons in Internal Medicine.

ORILLIA SOLDIERS’ MEMORIAL HOSPITAL
Orillia Soldiers’ Memorial Hospital (OSMH) is located in the City of Orillia providing a comprehensive range of programs and services including medical, surgical and emergency care, as well as outpatient services. OSMH’s primary service includes Orillia, Rama First Nation, and the Townships of Severn, Ramara, and Oro-Medonte, although through our regional programs we are able to offer kidney care, orthopedic care, sexual assault and domestic violence treatment complex continuing care, adult mental health care, seniors care, as well as pediatric and neonatal intensive care to patients throughout the North Simcoe Muskoka Local Health Integration Network (NSM LHIN) and beyond.

Interest applicants should apply by submitting a cover letter and CV to:
Jackie Shaughnessy
Medical Affairs Coordinator
jmshaughnessy@osmh.on.ca
www.osmh.on.ca
Acute Kidney Injury with Polyuria in a Patient with HIV
Samuel A Silver MD, Robert Richardson MD

Summary
We describe the case of a 30-year-old man with HIV with an elevated creatinine and three litres per day of urine output. Using this patient as a framework, we review a diagnostic approach to acute kidney injury with polyuria. This case emphasizes the importance of a complete diagnostic evaluation of acute kidney injury. Without this approach, it would have been easy to attribute the patient’s acute kidney injury to his HIV and necrotizing peri-anal infection, instead of the true life-threatening cause.

Case
A 30-year-old Caucasian man presented to hospital with fever and peri-anal abscesses. He suffered from chronic peri-anal fistulas and had previously undergone five fistulotomies. He also had a long-standing history of HIV treated with anti-retroviral therapy, but stopped his therapy six months previously. He had no history of opportunistic infections, and his most recent CD4 (T-cell) count taken two months prior to presentation was 460 cells/mm$^3$. His CD4 count on admission to hospital was 77 cells/mm$^3$. Abdominal imaging revealed intramuscular and fascial air throughout the right leg and pelvic muscles. There was loculated gas within the right mesorectum/presacral space. He was diagnosed with necrotizing fasciitis from a peri-rectal source and underwent a right above-knee amputation along with loop ileostomy. Cultures from the operating room later grew Streptococcus anginosus, and he was treated with appropriate antibiotics. He required several more debridements while in hospital and had a very slow convalescence.

Onset of Acute Kidney Injury
While the patient recovered, routine blood work (complete blood cell count [CBC], electrolytes, and creatinine) was done on a weekly basis. Three months after his first surgery, his serum creatinine was noted to be 250 $\mu$mol/L from a baseline the previous week of 50 $\mu$mol/L. A nephrology consultation (which included the authors) was requested.

Further history revealed that the patient was eating well with no significant gastrointestinal symptoms. His medication list included ritonavir, emtricitabine, tenofovir, atazanavir, metoprolol, cotrimoxazole prophylaxis, hydromorphone, and gabapentin. He had received no new nephrotoxic drugs such as non-steroidal anti-inflammatories or aminoglycosides. His last abdominal computed tomography (CT) scan, done three weeks earlier, reported normal-appearing kidneys.

Physical examination revealed a heart rate of 80 beats per minute (BPM) and blood pressure 140/90. His jugular venous pressure was below the sternal angle when supine. His lungs were clear. There was no ascites or peripheral edema. He had a foley catheter in place, and his urine output for the past several days averaged 3.5–4 L daily.

In addition to the serum creatinine of 250 $\mu$mol/L, his hemoglobin was stable at 75 g/L (131 g/L at admission), white blood cell (WBC) count 8.4 x 10$^9$/L, platelets 320 x 10$^9$/L, Na 131 mmol/L, K 4.2 mmol/L, HCO3 28 mmol/L, Cl 94 mmol/L. The low hemoglobin was secondary to anemia of acute illness from multiple surgeries and infection; there was no evidence of ongoing blood loss or hypotension that could have precipitated
Identifying the Cause of Acute Kidney Injury with Polyuria

The presence of acute kidney injury (AKI) with polyuria prompted additional investigations. The serum calcium was found to be 3.9 mmol/L (normal range 2.2–2.6 mmol/L), with an albumin of 25 g/L. Further testing into the etiology of his hypercalcemia revealed that parathyroid hormone, 25-OH vitamin D, and 1,25-OH vitamin D were low or undetectable. An abdominal ultrasound showed moderate to severe bilateral hydronephrosis. Bilateral nephrostomy tubes were placed to relieve the urinary tract obstruction, and the patient was treated with intravenous normal saline and pamidronate for the hypercalcemia. One week after initial nephrology consultation, his calcium was 2.14 mmol/L and creatinine 68 µmol/L. His urine output decreased to 1.5 L per day.

CT imaging (Figure 1) of his thorax, abdomen, and pelvis revealed extensive lytic bone lesions involving the manubrium, left scapula, thoracic and lumbar spine, ribs, pubic rami, pubic symphysis, and iliac bones. There were multiple enlarged abdominal lymph nodes, with the largest measuring 1.5 cm. The bladder wall was diffusely thickened. These findings were new compared to the CT imaging from four weeks earlier. The radiologist’s report suggested bacillary angiomatosis as the most likely diagnosis.

Discussion

The 30-year-old patient started with a necrotizing peri-anal infection, was followed by an episode of AKI with polyuria, and concluded with a likely diagnosis of metastatic bladder cancer. These three conditions warrant further discussion to review important learning points.

Necrotizing Peri- Anal Infections in Patients with HIV

Anorectal disease occurs in 6%—34% of patients with HIV.1 Peri-anal sepsis is known to be more prevalent in the HIV population (4.0%), compared with the general population (1.6%).1 Fistula and abscess are the most common forms of peri-anal sepsis in the HIV population. Complications of peri-anal sepsis include necrotizing fasciitis of the genital area, perineum, and peri-anal region (Fournier’s gangrene), and there are several case reports involving patients with HIV.2–5

The largest series of HIV peri-anal sepsis retrospectively reviewed 50 cases over a 10-year period.1 Seven (14%) of the patients had serious septic complications, consisting of Fournier’s gangrene (4) and metastatic abscesses (3). All four patients with Fournier’s gangrene were men aged between 34 and 41 years. Their mean CD4 counts were 200 cells/mm³, compared to 350 cells/mm³ for patients with uncomplicated peri-anal sepsis. The initial presentations included severe anal pain and fever. Previous treatment for peri-anal fistula had occurred in all four patients. Cultures revealed mixed flora in all patients (Klebsiella pneumoniae, Streptococcus group C, Streptococcus milleri,
Proteus mirabilis, and various anaerobes). In three patients, the necrotizing fasciitis was progressive and a diverting colostomy was performed. All four patients survived to hospital discharge. The median post-operative survival time for the entire cohort was 2.8 years.

Our case demonstrates a classic presentation of Fournier’s gangrene in a patient with HIV. The patient also had several common risk factors, including male sex, young age, low CD4 count, and previous treatment for peri-anal fistula. The only atypical feature was that a single organism was isolated (Streptococcus anginosus); however, Streptococcus anginosus is a common cause of necrotizing fasciitis. The severity of peri-anal sepsis and its complications emphasizes the importance of adequately treating asymptomatic fistulas in patients with HIV with surgical referral and fistulotomy.

**Cause of AKI and Polyuria**

The most striking and unusual feature of the patient’s AKI was polyuria, despite appearing to have significant volume depletion. Table 1 shows some of the causes of AKI with polyuria. These causes are not specific to patients with HIV, and we approached the diagnostic work-up as we would for a patient without HIV.

<table>
<thead>
<tr>
<th>Table 1. Causes of Acute Kidney Injury with Polyuria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Diuresis</strong> (under 1000 mosmol/day)</td>
</tr>
<tr>
<td>Central diabetes insipidus</td>
</tr>
<tr>
<td>• Posterior pituitary trauma or resection (with no access to water)</td>
</tr>
<tr>
<td>• Hypoxic encephalopathy post-cardiac arrest</td>
</tr>
<tr>
<td>• Granulomatosis with polyangiitis</td>
</tr>
<tr>
<td>Nephrogenic diabetes insipidus</td>
</tr>
<tr>
<td>• Electrolyte disorders (hypercalcaemia, hypokalaemia)</td>
</tr>
<tr>
<td>• Bilateral urinary tract obstruction</td>
</tr>
<tr>
<td>• Sjogren’s disease</td>
</tr>
</tbody>
</table>

Polyuria is defined as urine output over 3 L per day and may be due primarily to water loss (with normal solute excretion) or to solute diuresis driven by the excretion in the urine of larger than normal amounts of osmoles such as glucose, urea, or mannitol. Water diuresis can be separated from solute diuresis by calculating the 24-hour solute excretion rate from the urine flow rate and urine osmolality. A value greater than 1,000 mosmol/day suggests a solute diuresis whereas a value less than 1,000 mosmol/day suggests a water diuresis. Our patient was passing 500 mosmol/day. This suggested that the cause of the polyuria was likely due to a water diuresis.

Both bilateral urinary tract obstruction and hypercalcemia were identified as the causes of the patient’s water diuresis. It is often assumed that obstructed patients should be oliguric or anuric; however, patients with a partial obstruction can have a normal or increased urine output due to tubular damage causing a concentrating defect from decreased tubular reabsorption. Hypercalcemia causes polyuria by activating the calcium-sensing receptor in the thick ascending limb of the Loop of Henle. This results in decreased resorption of sodium and chloride in the Loop of Henle and decreases the kidney’s ability to concentrate urine, similar to furosemide. Therefore, AKI with polyuria in this patient was explained by both urinary tract obstruction and hypercalcemia.

Physicians are inclined to favour a unifying diagnosis over two or more unrelated diagnoses in perplexing cases such as this, but we found it difficult to imagine a single process that would cause urinary tract obstruction and hypercalcemia in this age group and over a relatively brief period of time. We therefore investigated the urinary obstruction and hypercalcemia independently, with no preconceived ideas of how they might intersect. Similar to our radiology colleagues, we were particularly interested in infectious etiologies, given the patient’s HIV history. Instead, the investigations revealed metastatic squamous cell carcinoma, with the bladder as the likely primary site.

**HIV and Risk of Malignancy**

Should the patient’s history of HIV infection have caused us to more seriously consider malignancy as our leading diagnosis? Several large prospective multicentre observational cohort studies and a meta-analysis have followed over 400,000 patients with HIV over 10-year periods. These studies suggest that patients with HIV have an increased risk of non-AIDS-defining cancer (NADC) compared to the general population. The cancers that account for most of this risk include anal, Hodgkin’s lymphoma, vaginal, liver, penile, leukemia, laryngeal, lung, oropharyngeal, and brain (Table 2). Thus it appears the current literature does not support an increased risk of bladder cancer in patients with HIV above the incidence rate in the general population.

A single retrospective case series identified 11 cases of bladder
cancer in patients with HIV over a 15-year period. The patients ranged in age from 33 to 67 years. Ten of these cases were due to transitional cell carcinoma, which is not surprising given that it accounts for 90% of all bladder cancers. The mean CD4 count was 280 cells/mm$^3$, and 9 of 11 patients were on anti-retroviral therapy. All patients diagnosed with metastatic disease died within seven months of presentation.

Our case represents the youngest-described patient with HIV and bladder cancer reported to date. Given our patient’s age and the aggressive course of the malignancy, it is tempting to attribute the bladder cancer to his immunosuppressed state from HIV. This was compounded by the patient’s cessation of anti-retroviral therapy six months prior to presentation. A Chinese registry study of over 3,500 patients found that most malignant diseases in patients with HIV occur at a more advanced stage and with shorter survival time; thus malignancy in patients with HIV is associated with an aggressive course.

Table 2: Incidence of Non-AIDS-Defining-Cancers in Patients with HIV

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Standardized Incidence Ratio (SIR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anal</td>
<td>28.75 (21.60-38.30)</td>
</tr>
<tr>
<td>Bladder</td>
<td>0.75 (0.43-1.32)</td>
</tr>
<tr>
<td>Brain</td>
<td>2.18 (1.29-3.68)</td>
</tr>
<tr>
<td>Breast</td>
<td>1.03 (0.89-1.20)</td>
</tr>
<tr>
<td>Colorectal</td>
<td>0.92 (0.78-1.08)</td>
</tr>
<tr>
<td>Esophageal</td>
<td>1.62 (1.20-2.19)</td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>11.03 (8.43-14.40)</td>
</tr>
<tr>
<td>Laryngeal</td>
<td>2.72 (2.29-3.22)</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.20 (2.51-4.09)</td>
</tr>
<tr>
<td>Liver</td>
<td>5.22 (3.32-8.20)</td>
</tr>
<tr>
<td>Lung</td>
<td>2.72 (1.91-3.87)</td>
</tr>
<tr>
<td>Melanoma</td>
<td>1.24 (1.04-1.48)</td>
</tr>
<tr>
<td>Oropharyngeal</td>
<td>2.32 (1.65-3.25)</td>
</tr>
<tr>
<td>Ovarian</td>
<td>1.63 (0.95-2.80)</td>
</tr>
<tr>
<td>Penile</td>
<td>4.42 (2.77-7.07)</td>
</tr>
<tr>
<td>Prostate</td>
<td>0.70 (0.55-0.89)</td>
</tr>
<tr>
<td>Renal</td>
<td>1.50 (1.23-1.83)</td>
</tr>
<tr>
<td>Stomach</td>
<td>1.90 (1.53-2.36)</td>
</tr>
<tr>
<td>Testicular</td>
<td>1.35 (1.01-1.79)</td>
</tr>
<tr>
<td>Thyroid</td>
<td>0.84 (0.51-1.40)</td>
</tr>
<tr>
<td>Vaginal</td>
<td>6.45 (4.07-10.20)</td>
</tr>
</tbody>
</table>

The SIR is obtained by dividing the observed number of cases by the expected number of cases. The expected number is calculated using data from a larger reference population. *Adapted from Grulich et al.*

Conclusion

A classic presentation of Fournier’s gangrene in a patient with HIV resulted in a surprising diagnosis of metastatic squamous cell carcinoma, likely due to a bladder primary. The key observation that led to this unusual diagnosis was the presence of AKI with polyuria. This case emphasizes the importance of a complete diagnostic evaluation of AKI, particularly when the patient has polyuria. Without this approach, it would have been easy to attribute the patient’s AKI to more common causes, such as acute tubular necrosis from Fournier’s gangrene. Instead, we identified a rapidly progressive and advanced bladder cancer and report the youngest case of bladder cancer in a person with HIV.

References

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