Advancing Technology: The Impact on Military Medicine

Military Medical Care Symposium, February 11, 2019

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Conflict of Interest

Jay J. Schnitzer, M.D., Ph.D. has no real or apparent conflicts of interest to report.

Agenda

- **Interaction of technology and military medicine**
  - **Importance of clinical pull versus technology push**
- **Historical context**
- **Modern examples**
- **Global changing landscape of technology innovation**
- **Training**

Learning Objectives

- This session will help healthcare delivery organizations bridge the digital and technology divide between military and civilian care settings and determine the appropriate lessons learned from both that can be applied to improve outcomes and benefit patients.

- Attendees will gain an understanding of the impact of advanced technologies development on military medicine, and the reciprocal examples, and how these can be applied to other settings, and advance patient care globally.

Interaction of technology and military medicine

- **The impact of technology on military medicine, versus**

- **The impact of military medicine on civilian medicine and technology, juxtaposed against**

- **The impact of technology on civilian medicine**

- **Clinical pull versus technology push**

Pasteur's Quadrant

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Fundamental Understanding

Yes — Pure Basic Research — **Bohr** | Use-Inspired Research — **Pasteur**

No — Unnamed | Pure Applied Research — **Edison**

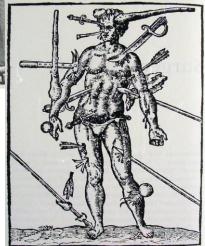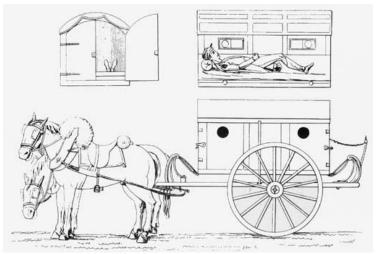**Practical Use** — No / Yes

Historical perspective (1)

- **Ancient Egypt and Rome**
- **16th Century France**
  - **16th century: Ambrose Paré**
  - **18th century: Dominique Jean Larrey**

Historical perspective (2)

- **American Civil War Ambulance Corps**
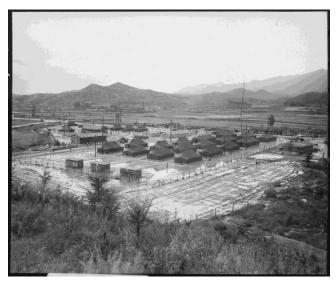- **World War II blood banking:**
  - **Dr. Charles Drew**

Portrait of Charles Drew; Associated Photographic Services, Inc - National Library of Medicine: http://profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/BGBBCT: Year supplied: ca. 1949 Original Repository: Howard University. Moorland-Spingarn Research Center. Charles R. Drew Papers; Permission details: Courtesy of the Moorland-Spingarn Research Center.

Recent examples

- **Korean War MASH units:
3rd Republic of Korea Mobile Army Surgical Hospital,
Wonju, Korea, 1951**
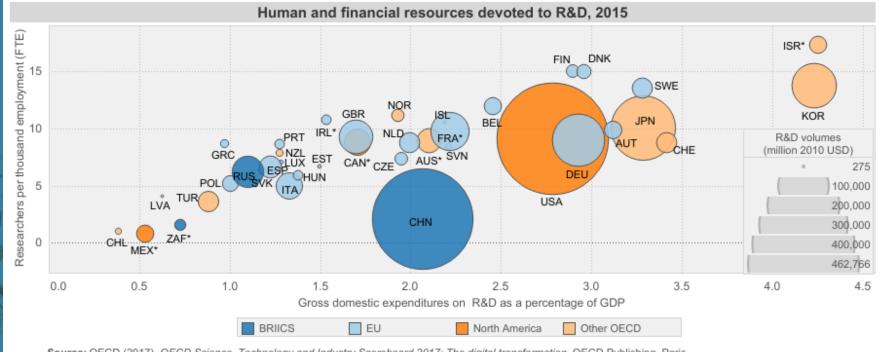
- **Vietnam War vascular surgery**

Modern technologies

- **Information technology**
  - **Electronic health records**
  - **Communications: Smartphones, hand helds**
- **Robotics / Prosthetics**
- **Sensors, including smart fabrics**
- **Non-compressible hemorrhage control**
  - **Novel bandages**
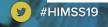 - **Pro-clotting agents (molecular sieve zeolites)**
  - **Tourniquets**

Human and financial resources devoted to R&D, 2015

Source: OECD (2017), OECD Science, Technology and Industry Scoreboard 2017: The digital transformation, OECD Publishing, Paris.
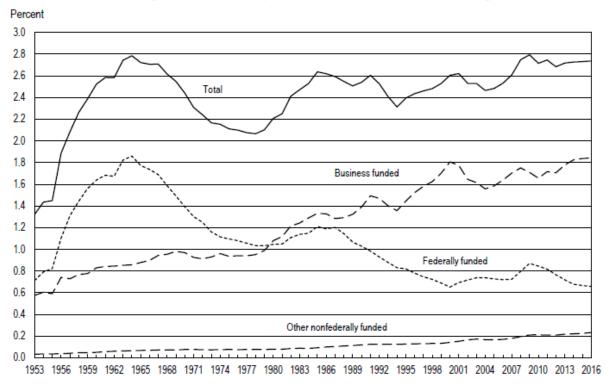Data and notes: http://dx.doi.org/10.1787/888933617035
* Latest available data prior to 2015

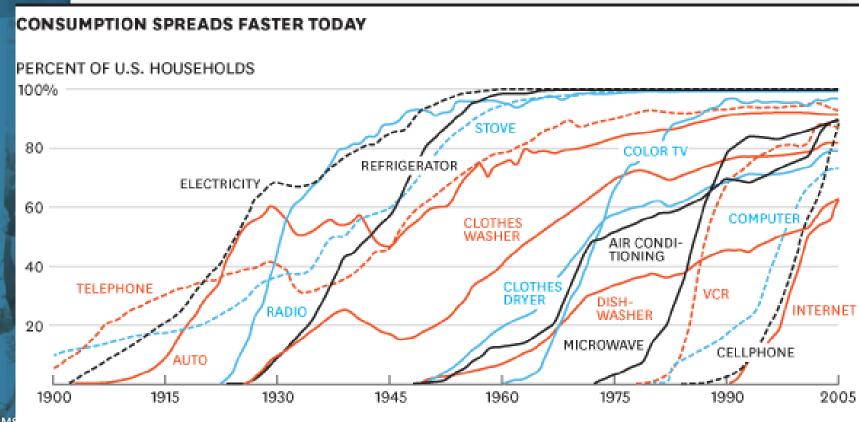# US R&D Investment 1953-2016

FIGURE 2. Ratio of U.S. R&D to gross domestic product, by source of business, federal, and nonfederal funding for R&D: 1953–2016
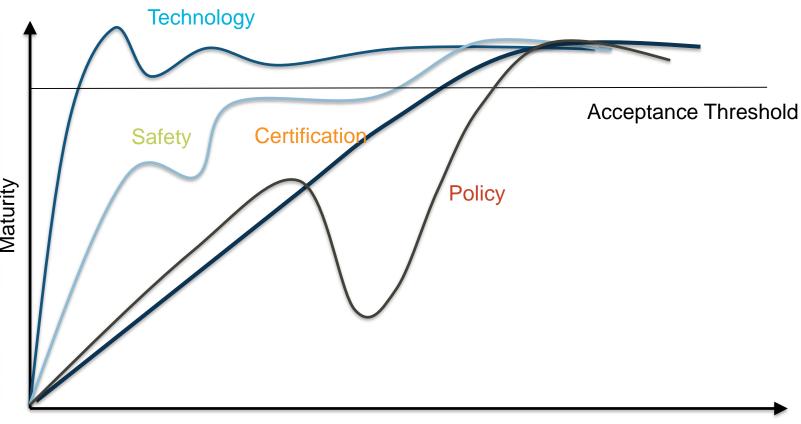
NSF InfoBrief NCSES December 2017 NSF 18-306;
www.nsf.gov/statistics/2018/nsf18306/nsf18306.pdf

The pace of technology

CONSUMPTION SPREADS FASTER TODAY

PERCENT OF U.S. HOUSEHOLDS

SOURCE MICHAEL FELTON, THE NEW YORK TIMES

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Technology

Acceptance Threshold

Safety   Certification

Policy

Maturity

Time

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Technology

Acceptance Threshold

Maturity

Shift the Curves Left!

Time

Training

Questions

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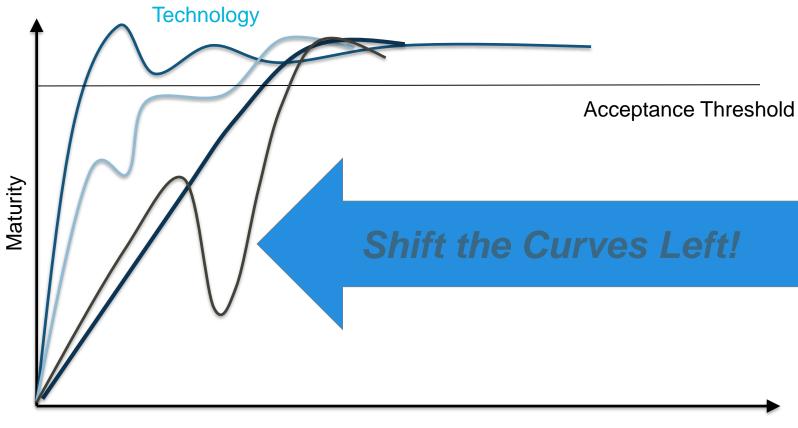
Please complete online session evaluation

Advancing Technology: The Impact on Military Medicine Session

February 11, 2019, Glenn Lanteigne, CEO of Tectonic

Tectonic

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Conflict of Interest

Glenn Lanteigne, MBA, CSSBB

Has no real or apparent conflicts of interest to report.

Agenda

- References
- Philosophy in Canada for Military Medical Care
- Statistics
- Canadian Military Integrated Health Strategic Priorities
- Optimize Technology Foster Innovation
- Innovation in the Military Healthcare System
- Innovation for Defence Excellence and Security (IDEaS)

References

- Canada

    - National Defence and the Canadian Armed Forces. *Surgeon General's Integrated Health Strategy – 2017 integration for better health*, 2017.

    - Tam-Seto, et al. *Identifying military family cultural competencies: experiences of military and Veteran families in Canadian health care*.Journal of Military, Veteran and Family Health, 10 September 2018.

- USA

    - The United States Military Health System (MHS) website provides several topics on military health care, including technology.

    - Selected articles:

        - Crown, Ellen. *Army medical device cyber team balances benefits and risks of technology*. Military Health System, 8 November 2018.

        - McCaffery, Tom. *Transformation underway across the Military Health System*. Military Health System, 29 January 2019.

        - Suits, Devon. *Migration to Defense Health Agency to modernize Army medicine, surgeon general says*. Military Health System, 5 February 2018.

- Further Reference:

    - Green, Bruce, Douglas Rosendale and Melissa Majerol. *Innovation in the military health system: top 10 emerging technologies that could yield dramatic improvements*. Deloitte Insights, 2018.

    - Khan, Saad. *Military health system transformation implications on health information technology modernization*. Military Medicine, 183(3), 56-59, 2018.

    - Landi, Heather. *VA-DoD leaders signal commitment to achieving interoperability, but what uphill challenges will they face?* Healthcare Innovation, 15 October 2018.

    - Levin, Dave. *VA-DoD: Winning the (Ongoing) Battle for Interoperability*. Healthcare Innovation, 22 January 2018.

More that just Cēpacol

Integration

.. — . — . —— —— . —— . — . —— .. —— — .

- Morse Code was a means of early communication used for transmitting messages by audible or visual signals that correlated to each letter of the alphabet.

- Before the invention of Morse Code and the telegraph, messages were still handwritten and carried by horseback.

- At the time of its invention, it revolutionized communication. Morse Code was especially pivotal during the second World War because it greatly improved the speed of communication – naval war ships were able to communicate with their bases and provide critical information to each other; war planes used

- Morse Code to detail locations for enemy ships, bases, and troops and relay them back to headquarters.

- Communication tools have come a long way since then, yet effective, clear, targeted and timely communication remains a challenge in today's fast-paced and complex organizations – including ours. The Morse Code on the cover serves to remind us that the successful implementation of an Integrated Health Strategy requires optimized communication and collaboration, within the Military and with all stakeholders, as we work toward our shared goal: better health.
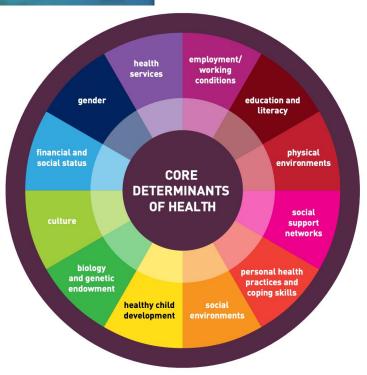
Philosophy of Medical Care in Canada
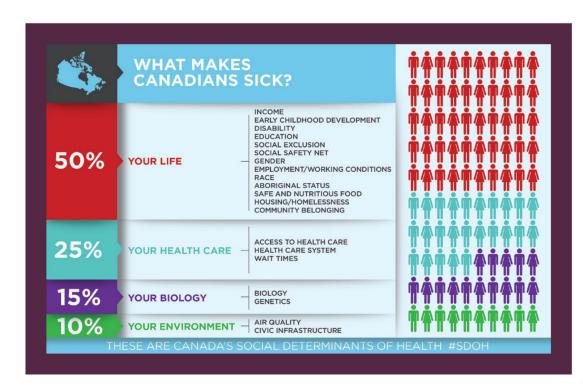
Shared Purpose

A patient-partnered health system with well-integrated health-related programs and services that maximize operational readiness and lifelong health.

- Health, particularly in a military context, is a complex concept unique to each person, difficult to define, and challenging to operationalize.

- We know that health is not merely the absence of illness, and that there are many determinants of health such as education, social supports and employment.

- The Canadian Medical Association considers access to health care and a health care system to be only 25% of the social determinants of health. (Figure 1)

- We also know that healthy Canadian Armed Forces (CAF) personnel are more resilient to both the physical and psychological challenges expected during a military career.

Figure 1 – The Determinants of Health – statistics provided by Canadian Medical Association, 2015

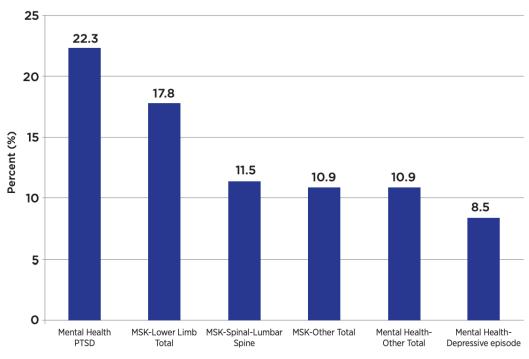**Figure 2 – Leading Causes of Medical Attrition (2016)**

Figure 3 – Integrated Health Strategic Priorities

Optimize Technology and Foster Innovation

Technology is a core part of Canadian life today and will continue to be in the future. We must embrace technology and look for innovative solutions as a way to not only improve how we work and communicate, but to change adverse health behaviours, provide better advice to CoC and, ultimately, improve the health of all CAF personnel.

- *Seek and employ technology to improve access to care.*
- *Seek and employ technology to improve patient engagement in their own care.*
- *Optimize technology to improve communications within CF H Svcs Gp and with civilian partners.*
- *Optimize technology to improve health surveillance.*
- *Optimize technology to remain current in all areas of clinical health care.*
- *Advance the use of personalized/precision health care.*

Innovation in the Military Healthcare System

Top 10 emerging technologies that could yield dramatic improvements

- Virtual health
- Augmented reality
- 3D printing
- Robotic surgery
- Next-generation patient-centered care
- Wearables
- Augmented intelligence (AI)
- Blockchain
- Precision medicine
- Regenerative medicine

Source: Deloitte Insight Report 2019

Innovation for Defence Excellence and Security (IDEaS)

- Create networks of innovators to conduct leading-edge research and development in areas critical to future defence and security needs;
- Hold competitions and invite innovators to present viable solutions to specific defence and security challenges; and
- Implement new procurement mechanisms that allow Defence to develop and test concepts and to follow through on the most promising ideas.

- $1.6 Billion Dollar Competition
- Over the years, the diversity of the Canadian Armed Forces personnel has helped create a strong, resilient and flexible military that is able to apply a broad array of perspectives and talents across the spectrum of operations.
- Under the competitive projects element of IDEaS, four contracts totaling $690K of the $1.6 Billion were awarded in response to the challenge of how the Canadian Armed Forces (CAF) can recruit, retain and increase representation of women. The four successful organizations were:
  - **SkyHive Technologies: "SkyHive Women in the Military**
  - **University of Waterloo: "Improving CAF Gender Diversity"**
  - **University of Ottawa: "A multi-stage approach to addressing sex-disparities in musculoskeletal injuries in military operators"**
  - **Xtract AI: "Smart recruiting using deep learning"**
- These were the first contract awards first call for proposals for the IDEaS program, which received over 600 proposals in response to the 16 defence and security challenges. In the coming months, contract awards for the remaining challenges will be announced.

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A More Integrated Approach to Delivering Health Care

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Questions

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