1. Urologic oncology continually innovates and progresses.
2. Big real innovation occurs in bursts (example robotic surgery, immunotherapy)
3. Urologists adopt to technology well
4. Change will accelerate, new developments will come faster
5. The future is bright, not scary
6. I have no conflicts of interest.
• Ancient Greek language and mythology provides the terminology:

Urology originates from Greek οὖρον (ouron) "urine" and -λογία (-logia) "study of"

Hermaphroditism (from Hermes and Aphrodite)

Venereal diseases (from the Roman name of Aphrodite, Venus)

Priapism (from Priapus)

Syphilis (from the shepherd Syphilos)
Hippocratic Collection - Past

“I will not cut, even for the stone, but I will leave such procedures to the practitioners of that craft.”

Importance of urine color and sediment

Urine characteristics reflect internal urologic disease

Figure 1
The famous plane tree in the island of Kos, native place of Hippocrates, under which the great physician of classical era taught young medical students (Engraving by Comte de Choiseul-Gouffier, Voyage pittoresque de la Grèce, 1782).
Phillip Bozzini (1773 – 1809)
The light conductor (Lichtleiter)
Maximilian Nitze, 1848-1906
Example of Early Cystoscopes

Irrigating cystoscope after JAHR

ca. 1928 : Cystoscope

Irrigating cystoscope after JAHR with ZEISS-KOLLMORGEN optics including:
Ventilverschluss, Spülhahn zum Aufstecken und Zweiwegehahn,
Sterilisationseinsatz, Ersatzlampen,
Schachtel mit Schmierfeettel und Dichtung, Lichtkable

Created by C.G. Heynemann, Leipzig

Object number: NLR-0618
Intuitive DaVinci Robot
FDA approval 2000
Grandfathers of Urologic Oncology

- Standardizing care – cystectomy performed in uniform manner
- Walking patients on stairs (old fashioned stress test)

Famous Statements:
1. If you can’t look good, don’t look bad.
2. Operating on dying patients is frequently followed by death.

Douglas E. Johnson, MD
1934-2015
Grandfathers of Urologic Oncology

Famous Statements:

The current state of prostate cancer may not be good medicine but it sure is good business.

There are more people making a living from prostate cancer than there are dying from it.

Willet F. Whitmore
1917 - 1995
Grandfathers of Urologic Oncology

• Developed MVAC for invasive bladder cancer in 1983
• Dose dense MVAC king of the hill 37 years later, better than Gem-Cis

Alan Yagoda, MD
1935-1995
Grandfathers of Urologic Oncology

- Pieter J. Donker, Leiden University, describe cavernous nerves, 1982
- Earliest efforts to preserve function during cancer surgery
- Later nerve sparing RPLND, 1984
Grandfathers of Urologic Oncology

Andrew C. Novick
1948-2008

- Popularized partial nephrectomy for RCC
- Idea of non radical resection with equivalent oncologic outcomes and better renal functional outcomes
- Part of wave of partial resections in other malignancies (breast cancer, limb salvage in sarcoma, etc)
- Rarely if ever rounded on patients (source Surena Matin MD, MDACC)
• concept of blocking T-cell inhibitory pathways as a way of unleashing anti-tumor immune responses

• drugs that target T-cell inhibitory pathways, which have been labeled as "immune checkpoint therapies"

• ipilimumab
Systemic therapy is usually given as a combination of agents from the following classes:

- Programmed cell death 1 protein (PD-1) checkpoint inhibitors (nivolumab and pembrolizumab)
- Programmed cell death ligand 1 (PD-L1) checkpoint inhibitors (avelumab and atezolizumab)
- Anti-cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) antibodies (ipilimumab)
- Vascular endothelial growth factor (VEGF) inhibitors (axitinib, sunitinib, pazopanib, and bevacizumab)
Better Treatment for Metastatic Bladder Cancer

- Cisplatin regimens (MVAC, dose dense MVAC, GC)
- Antibodies to programmed cell death 1 protein (PD-1) or its ligand (PD-L1): pembrolizumab, nivolumab, atezolizumab, durvalumab, and avelumab) targeting this pathway have been approved by the FDA for patients who have progressed during or after platinum-based therapy
- The combination of nivolumab plus ipilimumab is being investigated as first-line therapy versus standard of care chemotherapy in an ongoing phase III trial (NCT03036098).
- The presence of either a fibroblast growth factor receptor (FGFR) 3 or 2 genetic alteration predicts response to the FGFR inhibitor erdafitinib after progression on a platinum-based chemotherapy regimen
- Delayed cystectomy in otherwise disease-free responders
Other Developments in the Present

Intuitive Davinci SP System
102 consecutive PCa patients were prospectively randomized to TR-RALP (57) or RS-RALP (45).
Future Predictions for Urology

• Many future predictions are wrong.

• Perhaps safest predictions are to take current trends and extrapolate

• Weathermen are often wrong, so take everything with caution.
Demographic Trends

In North America, major economies have different age profiles:
- Canada: 42.2
- U.S.A.: 38.1
- Mexico: 28.3

Belize and Guatemala are the youngest countries in the Americas.

By 2100, close to half of the world’s kids (age 0-4) will live in Africa.

Monaco, in Europe, is the world’s oldest country.

Afghanistan is the world’s youngest, non-African country.

Japan’s population is significantly older than the rest of Asia.

2020: 173M Sub-Saharan Africa, 506M Rest of World
2100: 293M Sub-Saharan Africa, 377M Rest of World
American Urologists are Getting Older
American Urologists are Getting Older

<table>
<thead>
<tr>
<th>Age Group (Year)</th>
<th>Number</th>
<th>Percent (%)</th>
<th>+/- MOE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 34</td>
<td>541</td>
<td>4.3</td>
<td>0.7</td>
</tr>
<tr>
<td>35-44</td>
<td>2,840</td>
<td>22.4</td>
<td>1.0</td>
</tr>
<tr>
<td>45-54</td>
<td>2,633</td>
<td>20.8</td>
<td>0.9</td>
</tr>
<tr>
<td>55-64</td>
<td>2,875</td>
<td>22.7</td>
<td>1.0</td>
</tr>
<tr>
<td>≥ 65</td>
<td>3,771</td>
<td>29.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>12,660</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

(Data source: Weighted samples from the 2018 AUA Annual Census. The median age is 56.)
Median Age and Urology Workforce Status in Britain

• Median age expected to rise from 40.1 years in 2017 to 42.8 years in 2017

**Scenario 2 – “Realistic” requirement**

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Number over next 12 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of retired Urologists</td>
<td>474</td>
</tr>
<tr>
<td>Known consultants only, SAS grades not included</td>
<td></td>
</tr>
<tr>
<td>Expansion</td>
<td>299</td>
</tr>
<tr>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>New consultants available</td>
<td>624</td>
</tr>
<tr>
<td>Historical average (52 per annum)</td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>-149</td>
</tr>
</tbody>
</table>
How Many Hours Urologists Work?
Demographic Trends

• The median age of the U.S. population is expected to grow from age 38 today to age 43 by 2060.¹

• Median age in the EU will increase from 42.4 years in 2015 to 46.6 years in 2080.

• Urologic (and other diseases) increase with aging.

• Prediction for Future: Urologists will be busy in the future and will continue to work hard

• Urologic Physician Assistants will help with manpower shortage

• Prediction for Future: Health care systems and governments will be stressed by growing health care expenditures

¹ US Census bureau
The Future

Future Prediction: Big role for Artificial Intelligence in Urology

• Radiology and Pathology will be affected first with benefit for urologists.
• Radiology – already AI can predict prostate cancer on prostate MRI (64% accuracy), distinguish renal cell carcinoma from angiomyolipoma on CT imaging, predict T3 disease in bladder cancer on CT imaging (close to 90% accuracy).
• The radiologist’s gerbil wheel, one image every 3-4 seconds, 8 hours a day (Mayo Clinic).
• Pathology – already AI can predict Gleason score (88% accuracy overall), separating low and high grade prostate cancer 93% to 98% accuracy.
• AI pathology may transform poor places like Africa, where there are very few pathologists.

Moreira, Artificial Intelligence, AUA update 2019
5G Internet – No Big Deal to Urology

- 5G networks will increase internet speeds (dirt road to national highway!)
- This may make remote monitoring of patients with devices (blood sugar, EKG, etc) easier
- ? Take over a surgical case ( ? Robotic case) for a urologist struggling or encountering difficulty
- My prediction: No big deal in urology (I may get this one wrong)
Conclusions

1. We are practicing urology in the most advanced time in human history.
2. We have great technology (robot, better ureteroscopes) and an armamentarium of new drugs.
3. We are in a period of rapid change and technological advancement.
4. Europe and America are getting older and will have increased healthcare needs.
5. Healthcare systems and governments will be stressed to take care of more cases.
6. Urologists will be very busy.
7. AI will help urologists