Preventing & Treating Cervical Cancer in Low-Resource Settings

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Cervical Cancer is Preventable

- **Known Etiology:**
  - Human Papillomavirus (HPV)
- **Prevention:**
  - HPV Vaccination
- **Screening:**
  - Pap Test, HPV DNA Testing, VIA
- **Treatable Pre-Invasive Phase:**
  - Cervical Cone/LEEP/Cryotherapy
  - Takes ~10y to progress from pre-invasive disease to cancer

Dr. Harald zur Hausen
Nobel Prize, 2008
Cervical Cancer

United States:
• Estimated 12,900 new cases and 4,100 deaths per year
• 14\textsuperscript{th} most frequent cancer among women

Low & Middle Income Countries (LMICs):
• 1\textsuperscript{st} or 2\textsuperscript{nd} leading cause of cancer death among women
• >400,000 women dying per year

Torre et al, CA Cancer J Clin, 2015
Siegel et al, CA Cancer J Clin, 2015
Globocan 2015
85% of cervical cancer cases occur in the developing world
Texas-Mexico Border

Rio Grande Valley:

- Population of ~1.3 million
- 90% of population is Hispanic
- 40% below the poverty line
- <5% of eligible women are receiving cervical cancer screening
- LEEP services for only available one day per month (Gyn from UTMB travels to RGV)
- 31% higher cervical cancer rates
Houston, Texas
HPV Vaccine in the USA

- Recommended for girls and boys between at ages 11-12y (Gardasil, Cervarix, Gardasil9)
- 3 doses over 6 months
- 93-98% efficacy in prevention of cervical dysplasia/cancer if not previously infected
- Very safe
- Vaccines do not affect disease or infection present prior to vaccination
  - Need to give prior to onset of sexual activity

Slade et al., JAMA, 2009
Vaccine Adverse Event Reporting System (VAERS)
Scheller et al., JAMA, 2015
HPV Vaccination Rates - USA

• Females:
  – 1 dose = 60.0%
  – 3 dose series completion = 39.7%

• Males:
  – 1 dose = 41.7%
  – 3 dose series completion = 21.6%

• Australia, Canada, UK HPV vaccination >70%

• USA Hepatitis B vaccination rates >90%

*** No school-based vaccination program in USA

Centers for Disease Control, MMWR, 2015
Why We Still Need Screening

• Poor vaccination rates in the USA and vaccine not available in many countries

• Vaccines do not treat pre-existing HPV infections

*Screening will be necessary for the foreseeable future and still recommended after vaccination

Dr. George Papanikolaou 1883 - 1962
Cervical Cancer Prevention in USA

Three Clinical Visits:

1. Pap test +/- HPV testing
2. Colposcopy with cervical biopsies if abnormal Pap
3. If significant precancerous lesions (<5%) - conization/LEEP/cryotherapy
   - Removal or ablation of precancerous lesion

** Pathology/lab services required at each step
** Not feasible in low resource settings
Number of People per Pathologist:
- UK: 15,108*
- US: 19,232**

*Royal College of Pathologists, 2012
**Anatomic and Clinical Pathologists, AAMC, 2007

Adesina et al., Lancet Oncology, 2012
Visual Inspection with Acetic Acid (VIA)

- Low cost
- Performed by Primary Health Workers
- Can combine VIA with treatment (cryotherapy or LEEP) for a single visit “See & Treat” approach
- 31% decrease in cervical cancer mortality
- False positive results leading to overtreatment, increased cost and patient concern

Shastri et al., JNCI, 2014
High-Resolution Microendoscope (HRME)

• Novel cervical visualization technique
• Developed by Dr. Rebecca Richards-Kortum and team at Rice University
• Assesses morphologic features typically evaluated by pathologists in-vivo in real-time:
  – N/C ratio, nuclear size, atypia, pleomorphism
• Eliminates the need for colposcopy, cervical biopsies and pathology services
HRME

- Proflavine (topical contrast agent that stains nuclei) is placed on cervix
- A fiber-optic probe is applied
- Fluorescence from the proflavine-stained epithelium is transmitted back to the HRME
- Image is displayed on a computer screen in real-time allowing for “See & Treat”
HRME - Normal vs. CIN2/3
Reducing Size and Cost

$500  $1500  $2500
HRME - Objective Interpretation
HRME - Objective Interpretation
HRME in Mobile Unit
Training & Education

Project ECHO

Extension for Community Healthcare Outcomes
Project ECHO

Dr. Sanjeev Arora
Univ. of New Mexico

Dr. Ernest Hawk
MD Anderson
Project ECHO

Mission:
To expand capacity to provide best practice care for common & complex diseases in rural and underserved areas through telementoring

* Demonopolize Knowledge
Project ECHO

• Initiated in 2003 by Dr. Arora in response to Hepatitis C (HCV) crisis in New Mexico:
  – Patients in rural areas unable to travel to University specialists
  – Rural providers not comfortable treating HCV (complex medications, adverse effects, etc.)

• Identified primary care providers from 16 rural clinics and 5 prisons in New Mexico

• Started a telementoring program
Project ECHO

- Weekly teleconference
- Providers from the community clinics present cases (patient histories, lab results, treatment plans, challenges)
- Feedback and monitoring provided by the University specialists
- Community providers and specialists work together to provide quality care
- Telementoring not Telemedicine
Project ECHO

• Prospective study of 407 patients with HCV
• Compared patients treated at the University Hospital with 21 rural clinics/prisons
• No difference in Hepatitis C cure rates between the two groups
• No difference in serious adverse events
• Improved patient satisfaction and physician/provider self-efficacy

Arora, et al., NEJM, 364(23); 2011
Project ECHO

Ongoing Telementoring:

• Weekly 1 hour teleconferences
• Case presentations by local providers with feedback/discussion from specialists (45 min)
• Didactic session (15 min)
• Supplemented with hands on training/instruction
Project ECHO

1. Texas/Mexico Border:
   – Cervical dysplasia/pre-invasive disease

2. Latin America:
   – Cervical Cancer Prevention & Treatment (alternates):
     – Uruguay, Colombia, Mexico, El Salvador, Guatemala, Peru, Brazil

3. ECHO Africa:
   – Breast and cervical cancer management (surgery, radiation therapy, chemotherapy)
   – Zambia, Mozambique
Summary

• Cervical cancer is preventable
• 85% of cervical cancer cases and related deaths occur in developing countries and low-resource settings in the US
• Poor HPV vaccination rates in the USA
• Need novel screening techniques
• Training and education of local providers is critical to improve cervical cancer prevention and treatment – ECHO is a great model
Vaccinate Your Kids Against HPV!