Characteristics of nurse practitioner curricula in the US related to antimicrobial prescribing and resistance

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CIRAR

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Antimicrobial resistance

- Serious emerging global problem
- Started in the 1930's and 1940's
- Clearly not new but:
- ↑ number of resistant organisms
- ↑ geographic locations affected
- ↑ breadth of resistance in single organisms

Mayo Clin proc 2000;75:200-14; Nature Medicine 2004; Dec. Vol 10 #12 S122-29

MRSA

- 40-60% of nosocomial *S. aureus* is MRSA
- More deaths are associated with MRSA than MSSA
  Three US states have had VRSA
- New drugs:
- Daptomycin
- Linezolid
- Quinapristin/dalfopristin
- Tigecycline

Nature Medicine 2004; Dec. Vol 10 #12 S122-29

Community Acquired MRSA (CA-MRSA)

- Possess a new virulence toxin (Panton-Valentine leukocidin)
- Alaska natives, Native Americans, Pacific Islanders
- Incarcerated
- Competitive sports participants
- Military personnel
- Children
- IVDA
- MSM

Nature Medicine 2004; Dec. Vol 10 #12 S122-29; CID 2005:41 (Suppl 4) S269-72

FQ-resistant gonorrhea

- CDC 's Gonococcal Isolate Surveillance Project (GISP)
- FQ-resistant gonorrhea is continuing to spread and is now widespread in the United States
- As a consequence, this class of antibiotics is no longer recommended for the treatment of gonorrhea in the US

MMWR **April 13, 2007 / 56(14);332-336**

S. Pneumoniae resistance

- Emerged in the 1990's
- 35% (R) to PCN
- 30% (R) to macrolides
- 9-10% (R) to clindamycin
- 15-17% (R) to TCN
- 30-40% (R) to TMP/SMX
- 12% (R) to chloramphenicol

CID 2005;41:139-48

S. Pneumoniae resistance

- Changing fluoroquinolone activity
- 1817 isolates from 44 US medical centers
- 22.25% MDR
- Marked decreased FQ activity between 1999-2000 and 2001-2002.
- Sustained during 2002-2003: 21.9% of these isolates had mutations in *parC*

CID 2005;41:139-48

FQ (R) *E. coli* carriage in a LTCF

- VAMC in Philadelphia, Pa
- Identified from rectal swabs
- 51 % of participants had resistance
- FQ use was the only independent risk factor for FQ-(R) *E. coli* colonization
- Other risk factors:
- Duration of residence
- Prior metronidazole use

EID 2005: June Vol 11 #6 pp 889-93

Multi drug resistant *Klebsiella*

- ESBL producers: resistant to cephalosporins, FQ, and AG
- Sensitive only to carbapenems and amikacin
- Carbapenemase- producing *Klebsiella*
- Possess KPC enzymes
- Sensitive to Polymixin B + rifampicin, tigecycline

JAC 2005 May 25 advanced access

XDR-TB

- First reported in 2005
- WHO Emergency Global Task Force definition:
- resistance to at least isoniazid
- resistance to any FQ
- resistance to at least one second line injectable drug (amikacin, capreomycin or kanamycin)

MMWR 2006;55:1176

Outcome

- Morbidity and mortality rates are high
- Cost
- CDC estimates a cost of $4 billion annually for the treatment of resistant infections
- Prolonged hospitalization
- Higher relapse rates

Mayo Clin proc 2000;75:200-14

Reality of New Drug Development

Until the approval of linezolid, an oxazolidone, no new class of antibacterial had been approved for more than 25 years (2000)

JAMA2001;285:601-605

Factors associated with increased antimicrobial resistance

- Increased antimicrobial use in the hospital and community
- ↑ empiric antibiotics
- Prolonged courses
- Repeated courses
- Prolonged hospitalizations
- Prolonged stay in ICU
- Severely ill patients
- Immunocompromised
- Invasive devices and catheters
- Ineffective infection control
- Transfer of colonized patients between hospitals
- Antibiotic use in animal husbandry and agriculture
- International travel

Mayo Clin proc 2000;75:200-14

Efforts to decrease inappropriate antibiotic prescribing

- Cochrane Review of 63 studies (Arnold & Straus, 2005)
  - Single interventions (e.g., printed materials for providers, chart audits) resulted in small changes
  - Published guidelines – no effect
  - Clinician reminders resulted in decreased duration of tx but not number of scripts
  - Patient education – mixed (best if targeted to patients, clinicians, and community)
  - Interactive workshops – some effect
  - Delayed prescribing – some effect

Purpose

1. Assess current curricula related to antibiotics and AMR in NP programs in the U.S.
2. Assess the need for and interest in a web-based module on appropriate prescribing of antibiotics for potential incorporation in NP curricula

Methods

- 22-item, anonymous, self-administered, web-based survey developed by authors with the use of Survey Monkey®
- Study approved by Columbia Medical Center's IRB
- Main items covered:
  – Format of pharmacology course
  – Lecture hours related to antimicrobial therapy
  – Whether participant would be interested in using a web-based module to teach NP students

Survey Dissemination

- List of U.S. NP programs combined from the AANP website for a total of 312 schools
- One representative from each school (program director or pharmacology instructor) was e-mailed a cover letter and a link to the survey
- Follow-up reminder e-mail sent 2 weeks later

Data Collection and Analysis

- Responses anonymously compiled by electronic software as surveys were completed
- Data downloaded into Excel files
- Analysis with SPSS® software
  - descriptive statistics
  - Chi square tests to determine differences in various NP programs by type and region

Results - Demographics

- 149 of 312 participants responded (48%)
- Respondents were geographically dispersed
- Most frequent programs offered were FNP (88%) and ANP (48%)
- 81% of programs accredited by the AACN
- 99% of respondents indicated that their curricula met criteria for board certification
- More distance programs in western states vs. other geographical regions (43% vs 15%; $p < 0.001$)

Results- Curriculum

- 99% required a pharmacology course
- 82% used a combined format of free-standing pharmacology course and integrated into clinical or didactic course
- 80% used NONPF guidelines to develop pharmacology curriculum
- Most (79%) of pharmacology courses were 3 credits and 56% had an instructor with credentials at the PharmD level
- 95% had lectures dedicated to antimicrobial therapy

Results- Curriculum

- 53% of pharmacology courses provided more than 4 lecture hours on AMR
- 85% of schools incorporated lectures on antimicrobial therapy into non-pharmacology courses
- 88% reported that content on AMR was covered in both pharmacology and non-pharmacology courses
- 87% were aware of the CDC's AMR campaign
- 93% reported that they would use an electronic module for teaching students about AMR if it was available

Conclusions

- NP programs have comparable requirements related to
  - pharmacology course format
  - instructor credentials
  - lectures hrs devoted to antimicrobial tx and AMR
  - incorporation of antimicrobial topics into non-pharmacology courses
  - interest in electronic module to supplement current pharmacology requirements

Conclusions

- NPs misuse and overuse antimicrobial agents similarly to physicians
- A 3 credit pharmacology course with at least 4 lecture hours dedicated to AMR may not be sufficient for proper antimicrobial prescribing practices
- An electronic AMR module developed by the CDC and the AAMC may be a useful tool for teaching about AMR and appropriate prescribing

Limitations

- Potential for non-response bias – 52%
- However, there was a high percentage of agreement among the respondents, which makes this less likely

Implications for Practice

- Appropriate prescribing of antimicrobial agents is essential for controlling AMR
- Previous efforts to improve prescribing behavior have had little to no effect on prescribing practices
- Use of an electronic module to educate NPs about AMR and appropriate antibiotic prescribing is a potentially useful, relevant, and efficient way to improve prescribing practices

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