JOHNS HOPKINS MEDICINE
JOHNS HOPKINS BAYVIEW MEDICAL CENTER

TECHNOLOGY INNOVATION CENTER

Antibiotic Ninja

Seminar Presentation

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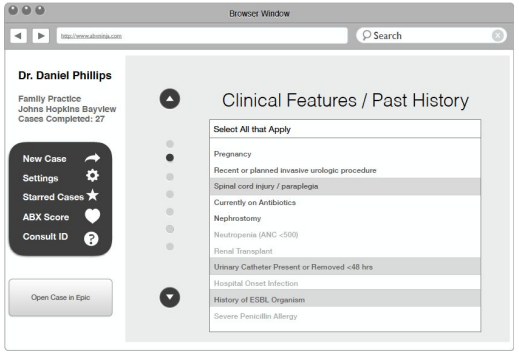
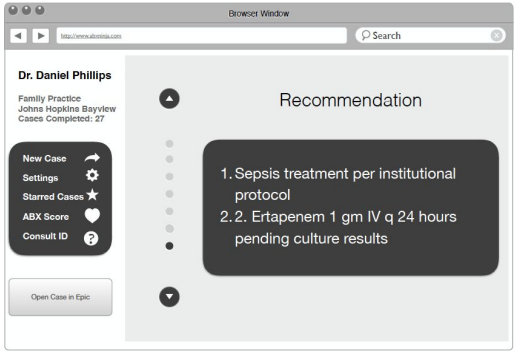
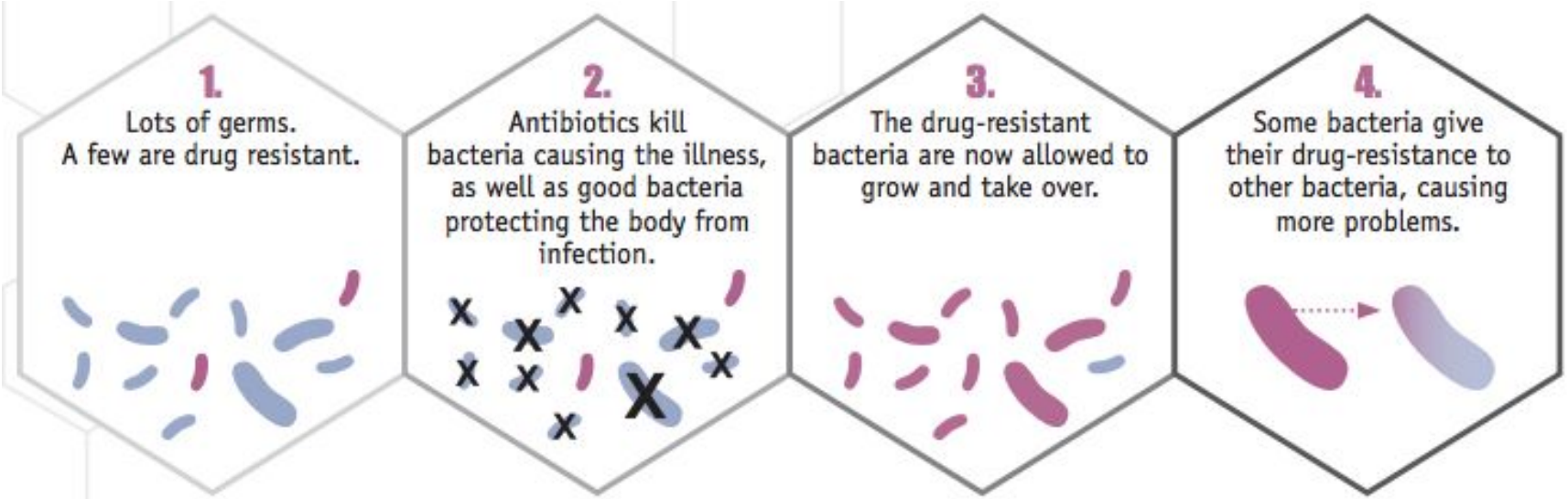
Antibiotic Ninja

Step	Task
1	Administrators customize decision trees
2	User selects the type of infections (SSTI, UTI, Respiratory)
3	Application fetches patient information from EMR
4	User inputs remaining information (i.e. other symptoms)
5	Application makes antibiotic recommendation



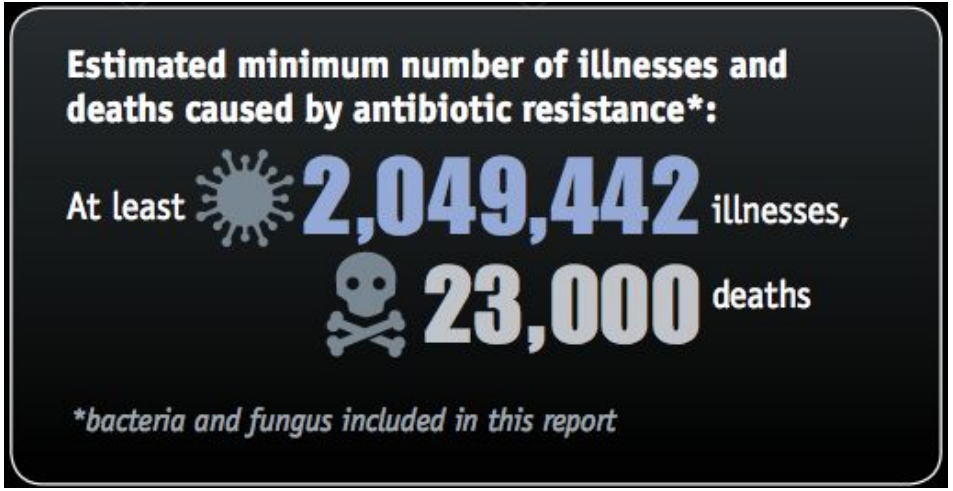


Background



CDC. Antibiotic Resistance Threats in the United States, 2013. Vol CS239559-B. Atlanta, GA2013:114.

Background



- Antibiotic Stewardship
  - Promote safe and appropriate use of antibiotics
- Clinical Decision Support System (CDSS)
  - Use patient information to produce an antibiotic recommendation
  - Standardize antibiotic prescription practices

CDC. Antibiotic Resistance Threats in the United States, 2013. Vol CS239559-B. Atlanta, GA2013:114.

Literature

- **Kawamoto, K. "Improving Clinical Practice Using Clinical Decision Support Systems: A Systematic Review of Trials to Identify Features Critical to Success." Bmj 330.7494 (2005): 765-0. Print.**
- Chow, A.l., A. Ang, C.z. Chow, T.m. Ng, C. Teng, L.m. Ling, B.s. Ang, and D.c. Lye. "Implementation Hurdles of an Interactive, Integrated, Point-of-care Computerised Decision Support System for Hospital Antibiotic Prescription." International Journal of Antimicrobial Agents 47.2 (2016): 132-39. Print.

Improving Clinical Practice Using CDSS

Question: What makes CDSSs successful?

Methodology:

- Screened relevant papers
- Reviewers evaluated success/failure of CDSS integration
- Features extracted from studies
  - No need for additional clinical data entry
  - Request documentation of the reason for not following CDSS recommendations
- Univariate and multiple logistic regression analyses

CDSS	Feature 1	...	Feature N
id1	0	...	1
...	...	...	...
idN	1	...	1

CDSS	Success
id1	0
...	...
idN	1

Improving Clinical Practice Using CDSS

Results:

- Logical fit in the clinical workflow
- Use at the time and location of decision making
- Offering recommendations rather than just assessment
- Electronic support

Table 6 Features of clinical decision support systems (CDSS) associated with improved clinical practice. Results of meta-regression analyses of 71 control-CDSS comparisons

Feature*	Adjusted odds ratio (95% CI)	P value
Primary analysis (all CDSS, n=71)		
Automatic provision of decision support as part of clinician workflow	112.1 (12.9 to ∞)	<0.00001
Provision of decision support at time and location of decision making	15.4 (1.3 to 300.6)	0.0263
Provision of recommendation rather than just an assessment	7.1 (1.3 to 45.6)	0.0187
Computer based generation of decision support	6.3 (1.2 to 45.0)	0.0294
Secondary analysis (computer based CDSS, n=49)†‡		
Automatic provision of decision support as part of clinician workflow	105.0 (10.4 to ∞)	0.00001
Secondary analysis (non-electronic CDSS, n=22)†§		
Provision of recommendation rather than just an assessment	19.4 (1.5 to 1263.0)	0.0164

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Improving Clinical Practice Using CDSS

Pros	Cons
• Analysis of features strongly correlated with CDSS success • Extensive research to find relevant studies	• Different types of CDSS • Does not consider CDSS that have not published outcome data • Did not include significant factors correlated to failure

Relevance:

- Implement successful features
- Logical fit into existing clinical workflow

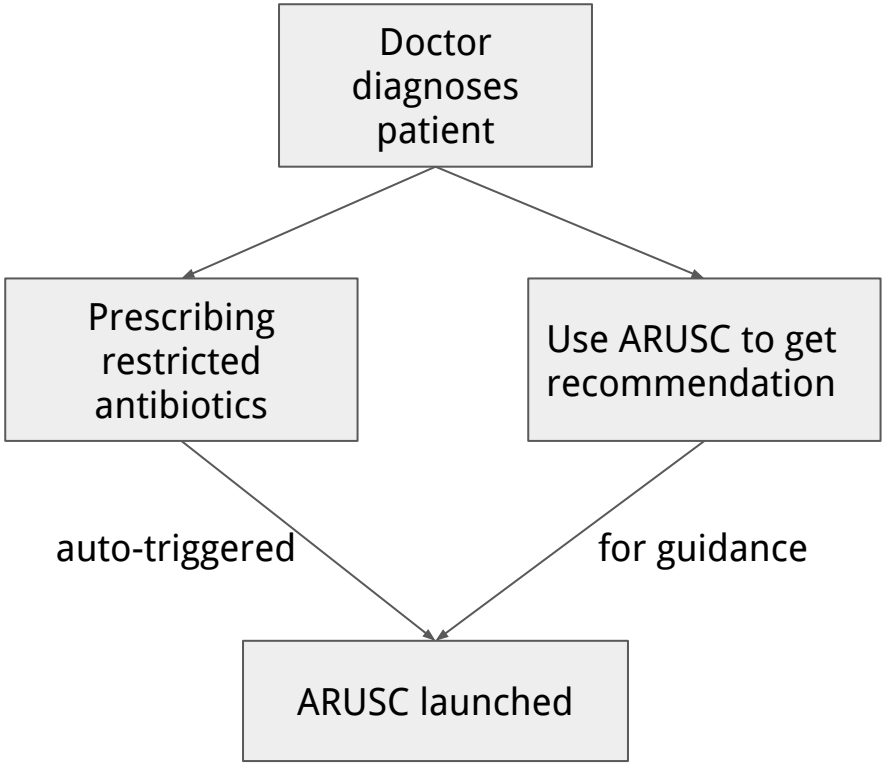
Literature

- Kawamoto, K. "Improving Clinical Practice Using Clinical Decision Support Systems: A Systematic Review of Trials to Identify Features Critical to Success." Bmj 330.7494 (2005): 765-0. Print.
- **Chow, A.l., A. Ang, C.z. Chow, T.m. Ng, C. Teng, L.m. Ling, B.s. Ang, and D.c. Lye. "Implementation Hurdles of an Interactive, Integrated, Point-of-care Computerised Decision Support System for Hospital Antibiotic Prescription." International Journal of Antimicrobial Agents 47.2 (2016): 132-39. Print.**

Antibiotic Resistance Utilization and Surveillance-Control

Background:

- Antibiotic Resistance Utilization and Surveillance-Control (ARUSC) is a CDSS implemented in a tertiary hospital in Singapore
- Uses data from EMR and physician input to make recommendation



Antibiotic Resistance Utilization and Surveillance-Control

Question: Are physicians completing the launches of the application and are they accepting the recommendations?

Methodology:

- Three release phases
- Determined whether or not application was exited prematurely
- Collected feedback to determine if recommendations were accepted

Antibiotic Resistance Utilization and Surveillance-Control

- Phase 1
  - Contains “X” button
  - Shortcut keys to exit
- Phase 2
  - Removal of “X”
  - Shortcut keys to exit
- Phase 3
  - Removal of shortcut keys

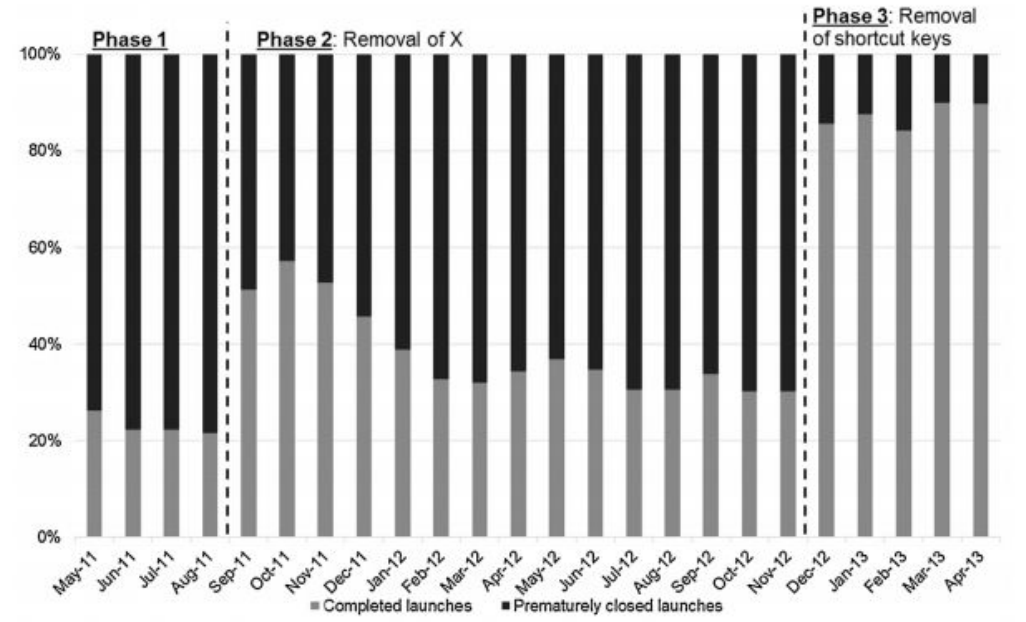


Fig. 2. Trend of completed ARUSC launches per month. ARUSC, Antibiotic Resistance Utilisation and Surveillance-Control.

Chow, A.l., A. Ang, C.z. Chow, T.m. Ng, C. Teng, L.m. Ling, B.s. Ang, and D.c. Lye. "Implementation Hurdles of an Interactive, Integrated, Point-of-care Computerised Decision Support System for Hospital Antibiotic Prescription." International Journal of Antimicrobial Agents 47.2 (2016): 132-39. Print.

Antibiotic Resistance Utilization and Surveillance-Control

Table 1
Characteristics of patients, specialty and type of ARUSC launches across phases.[a]

Characteristic	Phase 1 (1 May to 11 Sept. 2011) (n = 11,151)	Phase 2 (12 Sept. 2011 to 28 Nov. 2012) (n = 34,497)	Phase 3 (29 Nov. 2012 to 30 April 2013) (n = 11,345)	Total (1 May 2011 to 30 April 2013) (n = 56,993)
Age (years) (mean ± S.D.)	73.2 ± 15.6	72.3 ± 15.5	71.0 ± 15.8	72.3 ± 15.6
Male sex[b]	5742 (51%)	18,334 (53%)	6092 (54%)	30,168 (53%)
Specialty[b]				
Internal medicine	5214 (47%)	14,744 (43%)	4864 (43%)	24,822 (44%)
Geriatric medicine	1177 (11%)	3563 (10%)	1071 (9%)	5811 (10%)
Medical subspecialties	2661 (24%)	8661 (25%)	3060 (27%)	14,382 (25%)
General surgery	804 (7%)	3143 (9%)	1016 (9%)	4963 (9%)
Orthopaedic surgery	547 (5%)	1783 (5%)	528 (5%)	2858 (5%)
Other surgical	743 (7%)	2566 (7%)	800 (7%)	4109 (7%)
ARUSC launch for guidance[b]	6515 (58%)	17,291 (50%)	5764 (51%)	29,570 (52%)
Completed ARUSC launches[b]	2572 (23%)	13,244 (38%)	9884 (87%)	25,700 (45%)
Accepted ARUSC launches[c]	1925 (75%)	8784 (66%)	6488 (66%)	17,197 (67%)

Chow, A.l., A. Ang, C.z. Chow, T.m. Ng, C. Teng, L.m. Ling, B.s. Ang, and D.c. Lye. "Implementation Hurdles of an Interactive, Integrated, Point-of-care Computerised Decision Support System for Hospital Antibiotic Prescription." International Journal of Antimicrobial Agents 47.2 (2016): 132-39. Print.

Antibiotic Resistance Utilization and Surveillance-Control

Pros	Cons
• Identified hurdles in integration of CDSS	• Did not assess the efficacy of the CDSS • No information regarding the underlying algorithm

Relevance:

- Can prevent exiting application prematurely
- Need to collect outcome data to assess efficacy of decision trees

Final Takeaways

Features needed for success:

- Logical fit into clinical workflow
- Allow for usage at the time of decision making
- Create recommendation

Avoid:

- Allow easy exit from application prior to completion
- Major disruption to existing workflow

References

Chow, A.l., A. Ang, C.z. Chow, T.m. Ng, C. Teng, L.m. Ling, B.s. Ang, and D.c. Lye. "Implementation Hurdles of an Interactive, Integrated, Point-of-care Computerised Decision Support System for Hospital Antibiotic Prescription." International Journal of Antimicrobial Agents 47.2 (2016): 132-39. Print.

CDC. Antibiotic Resistance Threats in the United States, 2013. Rep. Vol. CS239559-B. Atlanta, GA: n.p., 2013. Print.

Huh, Kyungmin, Doo Ryeon Chung, Hyo Jung Park, Min-Ji Kim, Nam Yong Lee, Young Eun Ha, Cheol-In Kang, Kyong Ran Peck, and Jae-Hoon Song. "Impact of Monitoring Surgical Prophylactic Antibiotics and a Computerized Decision Support System on Antimicrobial Use and Antimicrobial Resistance." American Journal of Infection Control 44.9 (2016). Print.

Kawamoto, K. "Improving Clinical Practice Using Clinical Decision Support Systems: A Systematic Review of Trials to Identify Features Critical to Success." Bmj 330.7494 (2005): 765-0. Print.

Townsend, Jennifer, MD, ed. Implementation Guide to Establish Antimicrobial Stewardship Practices among Hospitalists and Other Hospitalist Clinicians. Rep. N.p.: Society of Hospital Medicine, 2016. Web.

Questions?