

N. Deborah Friedman, Elizabeth Temkin, Dana Levit, Eyal Taleb, Bethlehem Mengesha, Ronit Zaidenstein, Tsilia Lazarovitch, Mor Dadon, Chen Daniel, Keith S. Kaye, Dror Marchaim.

## Introduction

- ❖ MDROs have spread from hospitals to other healthcare settings and to the community.
- ❖ "Healthcare-associated infection" (HcAI) is a definition frequently used to describe community-onset infections more likely to be caused by an MDRO among patients with significant healthcare exposure.
- ❖ This definition leads to recommendations for patient management, particularly pertaining to empiric antimicrobial choices, and for implementing certain Infection Control practices and measures.
- ❖ The most frequently used definition was developed at Duke University in 2002 (Duke-2002) by Friedman et al: infections which are diagnosed in the first 48 hours of hospitalization in patients with at least one of the following:
  - 1) IV therapy or other nursing care at home;
  - 2) Hemodialysis;
  - 3) IV chemotherapy in the previous 30 days;
  - 4) hospitalization in an acute care hospital in the preceding 90 days or residence in a nursing home or any LTCF.
- ❖ Some professional societies have based management recommendations on Duke-2002 (or modifications thereof), but **neither Duke-2002 nor other variations** have had their performances **measured**.

## Study aim

- ❖ We studied patients with BSI present on admission in order to: 1) test whether the HcAI definition/s was predictive of MDRO BSI; and 2) to develop an alternative score to predict whether bacteremia is caused by an MDRO.

## Methods

- ❖ Case-control study, Assaf Harofeh Medical Center (AHMC), Israel.
- ❖ All patients with BSI upon admission (first 48 hours), **January to July 2013**.
- ❖ Cases were patients whose BSI was caused by an MDRO; controls were patients whose BSI was not caused by an MDRO.
- ❖ A multivariable model to predict MDRO infection on admission was used in order to develop a prediction score.
- ❖ We calculated the performances of this score and of the Duke-2002 definition plus modification/s.

## Results

- ❖ **315** patients with bacteremia present on admission were enrolled: **100** cases and **215** controls.
- ❖ Our eventual score included 6 items: hospitalization in the past 90 days, LTCF stay prior to hospitalization, dialysis, antibiotic use in the past 90 days, neurological disease, & severe sepsis.

**Table I – Final multivariable model and prediction score for MDRO-BSI on admission**

Parameter	$\beta$ -Coefficient	OR (95% CI)	p-value	Points
Hospitalization in previous 90 days	0.51	1.7 (0.87-3.2)	0.13	1
Residence in LTCF prior to hospitalization	1.5	4.3 (2.2-8.3)	<0.001	3
Regular (weekly) outpatient visits	-1.0	0.36 (0.14-0.94)	0.04	-2
Haemodialysis	2.1	8.0 (1.7-36.9)	0.01	4
Antibiotic use in previous 90 days	0.84	2.3 (1.2-4.4)	0.01	2
Neurological disease	0.51	1.7 (0.9-3.1)	0.10	1
Severe sepsis level	0.48	1.6 (0.90-2.9)	0.10	1

- ❖ Using a cutoff score of 4, sensitivity was **70%**, specificity was **79%**, PPV was **60%** and NPV was **85%**; the area under the ROC curve was **0.74**.

**Table II – Performance of previously used definitions at predicting MDRO-BSI on admission**

Definition/Score	Sensitivity	Specificity	PPV	NPV	AUC ROC
Duke 2002	87%	49%	44%	89%	0.68
Modified Duke 2002	90%	43%	42%	90%	0.66
Pitt Bacteremia score $\geq 4$	27%	92%	60%	73%	0.59

## Conclusions

- ❖ Although the term HcAI is frequently used in a descriptive sense, it does not perform well at predicting whether BSI on admission is caused by an MDRO.
- ❖ Our alternative score was also not a good predictor of MDRO BSI with onset in the community.
- ❖ A definition or prediction rule that more accurately predicts whether an infection present on admission is caused by an MDRO is needed to both **improve empiric antibiotic selection and reduce unnecessary use of broad-spectrum agents**.