Health Information Technology Department
Mashhad University of Medical Sciences

In the name of God

Mashhad University of Medical Sciences

IMPACT OF COMPUTERIZED PROVIDER ORDER ENTRY (CPOE) ON LENGTH OF STAY AND MORTALITY

Halimeh Jamal

Dr. Mearajy

jamalh951@mums.ac.ir

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INTRODUCTION

Over the last 15 years the Institute of Medicine, the United States government, and others have examined health care safety and efficiency, including electronic health records (EHRs). Despite these publications, the impact of EHRs on patient outcome measures remains uncertain.

INTRODUCTION CONTINUE

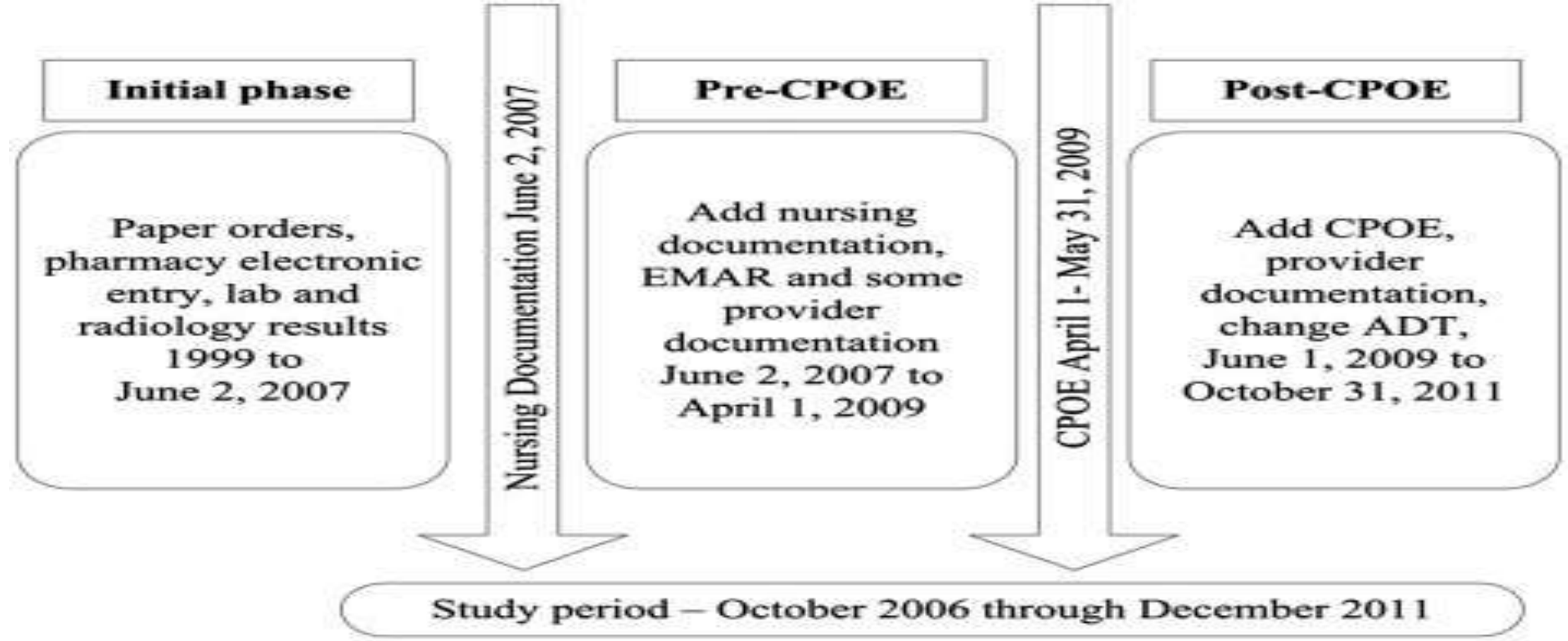
This study aims

- to expand on the previous studies
- understanding of the impact CPOE on length of stay (LOS) and mortality

INTRODUCTION CONTINUE

Anticipating that a single-system EHR would improve patient outcomes and efficiency and increase reimbursement, the University of Utah Health Sciences Center progressively implemented a system between 1999 and 2007.

INTRODUCTION CONTINUE



MATERIALS AND METHODS

- This 5-year retrospective, pre-post design (2.5 years each) study was conducted at an academic medical center comprising a **450-bed medical and surgical hospital**, **a 50-bed cancer hospital**,and a **90 bed psychiatric hospital** .
- The total sample of **104 153** hospital admissions included **66 188** unique patients.

MATERIALS AND METHODS

Antecedent variables represent intrinsic patient characteristics and include **demographics** and potential confounders that can vary with each inpatient admission.

- smoking status
- body mass index
- zip code
- insurance type
- admission via the emergency department (ED)

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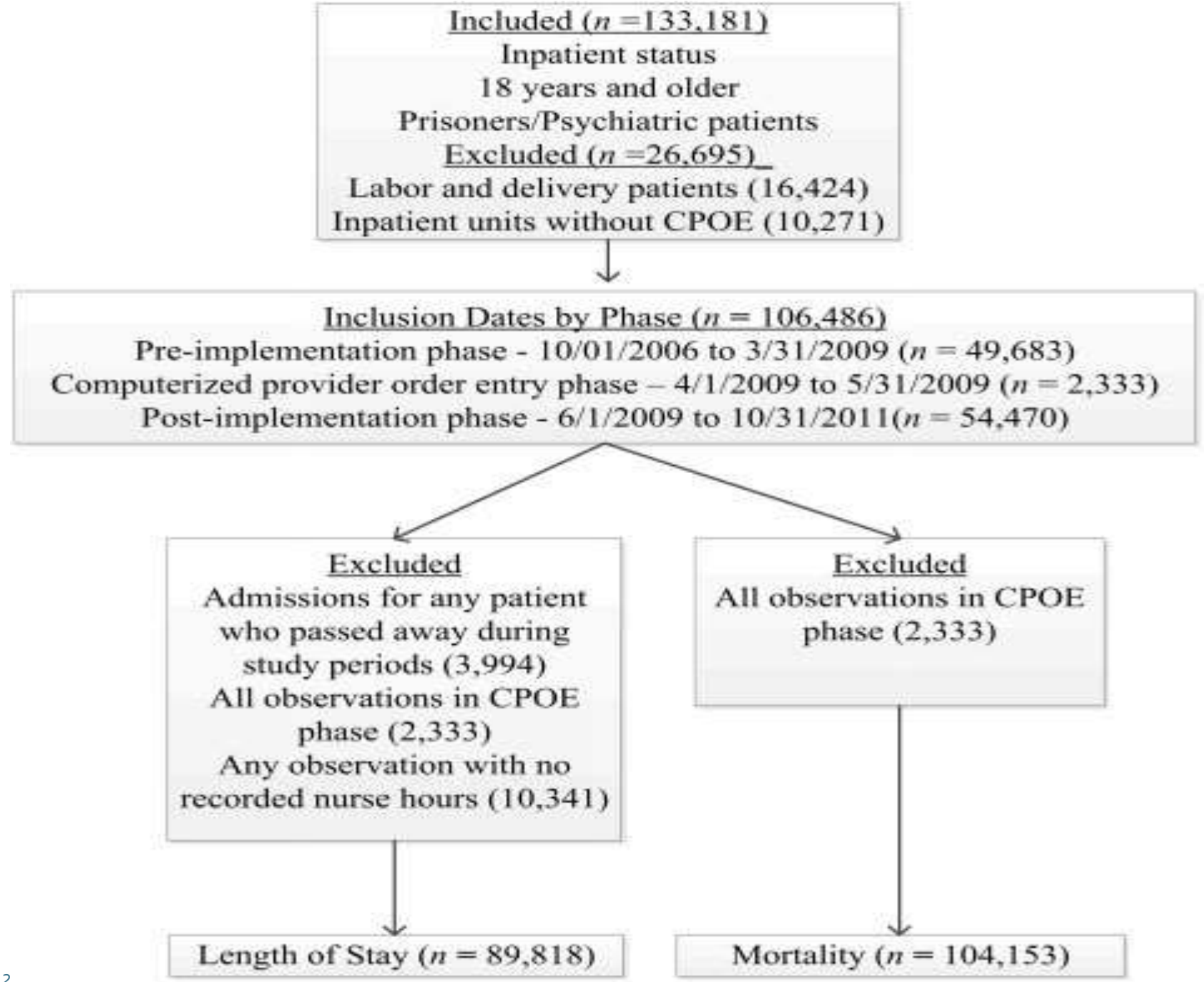
MATERIALS AND METHODS CONTINUE

Process variables reflect actionsperformed during care, including :

- CPOE implementation
- rapid response team activation
- resuscitation team activation
- and registered nurse hours


Included (n =133,181)
Inpatient status
18 years and older
Prisoners/Psychiatric patients
Excluded (n =26,695)
Labor and delivery patients (16,424)
Inpatient units without CPOE (10,271)
Inclusion Dates by Phase (n = 106,486)
Pre-implementation phase - 10/01/2006 to 3/31/2009 (n = 49,683)
Computerized provider order entry phase – 4/1/2009 to 5/31/2009 (n = 2,333)
Post-implementation phase - 6/1/2009 to 10/31/2011(n = 54,470)
Excluded
Admissions for any patient who passed away during study periods (3,994)
All observations in CPOE phase (2,333)
Any observation with no recorded nurse hours (10,341)
Excluded
All observations in CPOE phase (2,333)
Length of Stay (n = 89,818)
Mortality (n = 104,153)

ANALYSIS STRATEGY

Two models were constructed for each dependent variable. The first model evaluated each of the 22 patient care units as a unique unit of analysis.

An intermediate step grouped the units by the Centers(NHSN) reducing the number of units to 14.

Similar unit types were further recoded as 1 of 5 major patient care unit types medical/surgical, intensive care, oncology, psychiatry, or rehabilitation

ANALYSIS STRATEGY

- . HPMixed procedure in SAS (v. 9.3) was used for analysis of LOS, a continuous depen- dent variable. Mortality was assessed with generalized linear mixed procedures in SPSS for Windows (v. 21.0).

RESULTS

- Statistically significant decreases occurred in both measures at the facility level.
- Differences between patient care units were noted when comparing units individually and when similar units were grouped.
- At the room level, statistically significant differences were found between private
- and semiprivate rooms for both LOS and mortality.

RESULTS CONTINUE

- Structure items and new knowledge gained

	Structure types	N	New knowledge
1	Facility	3	Overall trend showed decrease in LOS and mortality.
2	Unit type (grouped)	5	Differences in LOS and mortality between med/surg and ICU.
3	Unit type (standard)	14	Not evaluated
4	Unit type (local)	22	Unit culture, order set type, end-user training, and patient severity may impact results.
5	Room	350-450	Semi vs private showed results contradictory to previous studies.

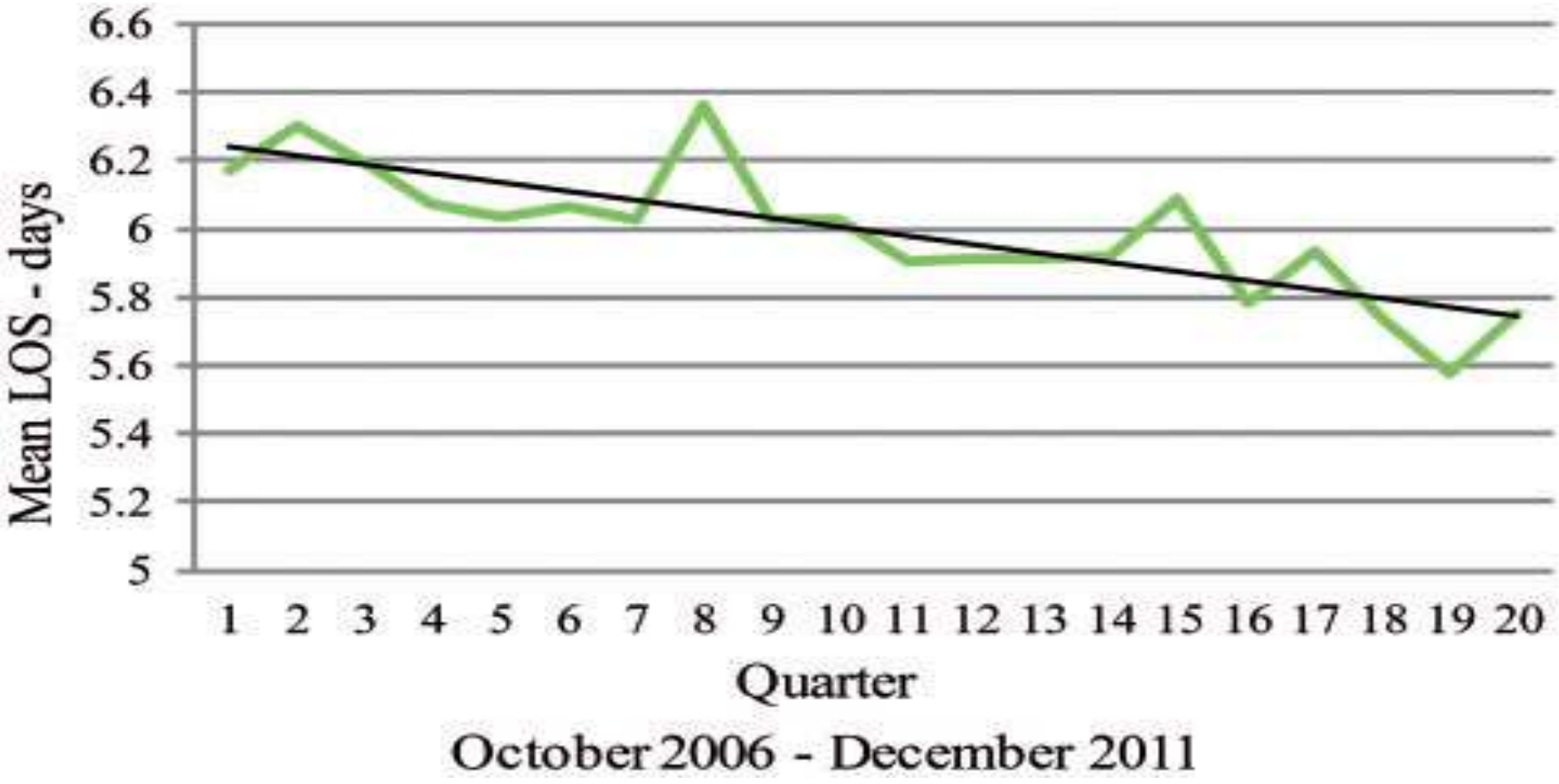
RESULTS
LENGTH OF STAY

A total of 89 818 admissions were used in the analyses, pre n = 39 387 (43.9%) and post n= 50 431 (56.1%). The 28% increase in the number of admissions during the post phase was due in part to the addition of hospital rooms.

RESULTS
LENGTH OF STAY

Also found at the facility level was a gradual decrease in LOS over the course of the study . Quarter 4, the quarter after nursing documentation was implemented, showed a decrease below the trend line.

RESULTS CONTINUE
LENGTH OF STAY



October 2006 - December 2011

RESULTS CONTINUE MORTALITY

A total of 104 153 admissions were included, pre n= 49 683 and post

N=54 470, representing a 9.6% increase in admissions during the phase .

Gender and state of residence were not statistically significant .

Palliative care status, code team activation, and rapid response team activation magnified the results (tripling or quadrupling)

RESULTS CONTINUE MORTALITY

Although mortality incidences also increased,

from **833** to **955**, mortality rate decreased, from **1.78% in the pre-implementation phase to 1.75% in the post-implementation phase.**

Furthermore, study phase (pre- or post-CPOE) remained a statistically significant predictor of mortality after accounting for confounders.

DISCUSSION
LENGTH OF STAY

Differences in LOS were associated with structure variables including

At the facility level, LOS was shortenedon average, by almost 1 day.

At the patient unit level, fluctuations were noted between patient care units

Differences were also found between private and semiprivate rooms

.

DISCUSSION CONTINUE LENGTH OF STAY

It is not possible to control for all the longitudinal changes in care; however, 15 variables were controlled for, supporting the finding that CPOE had an independent, statistically significant impact

DISCUSSION CONTINUE

Mortality

Both models in this study showed a statistically significant decrease in mortality.

The 5 most significant predictors of mortality were study phase(pre- orpost-CPOE),admitted via the ED, room status, age older than 80, and ethnicity.

DISCUSSION CONTINUE

Mortality

- Most medical/surgical units had reduced mortality rate, while an opposite trend was observed in the ICUs.
- The results in the med/surg units may be representative of standards of care, in the form of diagnosis-or procedure-specific order sets created by medical content experts for the CPOE implementation.

DISCUSSION CONTINUE

Mortality

Two very interesting patterns were noted . The first pattern showed that mortality increased in the 3 months immediately preceding both nursing documentation and CPOE implementation.

DISCUSSION CONTINUE

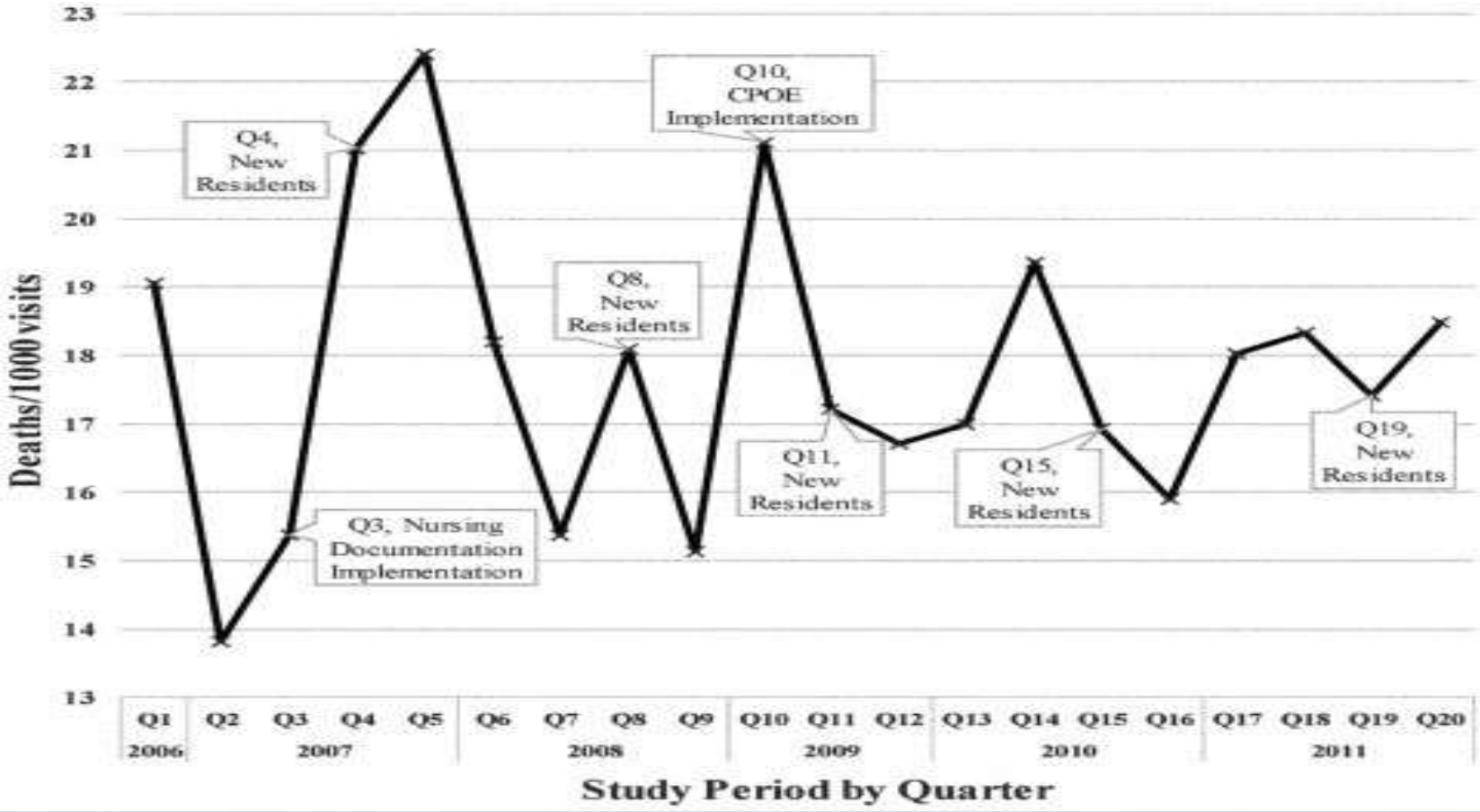
Mortality

The second observed pattern was a **decrease in mortality** in the post-CPOE implementation phase during the quarter when new physician residents arrived. In the pre-implementation period, mortality increased during these quarters.

In the post implementation period, there was an unexpected decrease in the quarter immediately following CPOE implementation.

DISCUSSION CONTINUE

Mortality



STRENGTHS AND LIMITATION

This study was unique in examining the impact of CPOE on patient outcome measures from the facility, patient unit, and individual patient levels.

One of the key strengths is the **large sample size**, which included 3 hospitals, 22 patient care units, and more than 89 000 observations on over 58 000 patients, which makes it larger than any previous study.

STRENGTHS AND LIMITATIONS

- This retrospective study did not examine the effects of differences in a patient care unit's culture, policies and procedures, management style, patient acuity and comorbidities, or training.

CONCLUSIONS

Statistically significant reductions in both length of stay and mortality were expected and found in the post-CPOE phase.

CONCLUSIONS CONTINUE

Unexpected results include an increase in mortality in the 3 months preceding the 2 major implementations, revealing potential "changeruptions" to the nursing staff, and the repeated decrease in mortality in the quarters corresponding to new resident arrival.

A third unexpected result is the association noted with semiprivate rooms and decreased LOS and mortality.

Thanks for Your Attention

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Halimeh Jamal

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