Jefferson™
School of Population Health

Systems Engineering for Population Health

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LEARNING OBJECTIVES

- What is a basic system approach to the health of a population?
- What are the key elements of such a system?
- How do those elements come together in a operational way in the clinical setting?

The "Framework:"
THE "CULTURE" OF MEDICINE

- Authority
- Autonomy
- "Medicine is an inexact science."
- "Whatever my doctor says!"
- Basically treating patients one by one and not as a population

EARLY ATTEMPTS AT PHYSICIAN QUALITY MONITORING

- Surgical review conferences
- Mortality review and evaluation
- Standard "questions posed"
  - ✓ "Was this patient expected to expire when admitted to the hospital?"
  - ✓ "Would most practitioners have handled this case in similar way?"
  - ✓ Was standard of care met?"
- Reviewing outcomes one by one, not as a population.

THE REAL QUESTIONS ARE:

WHAT IS STANDARD ??

WHAT WOULD "MOST" PHYSICIANS DO?

"THE BELL CURVE"

- Published in 2004 – *New Yorker* Magazine
- Atul Gawande, MD – thyroid surgeon
- Outcomes of 31 Cystic Fibrosis Centers in the USA
- Length of life varied in 2003 from 33 to 47 years depending on the center.
- All centers were treating the disease "by the book".

NEW YORKER
NEWYORKER.COM

HOW GOOD ARE WE ???

- Hernia repair
  recurrence 1:5 to 1:20.
- Colon cancer 10-year
  survival 21% to 63%
- New York State risk-adjusted death rates for coronary surgery 5% to under 1 %.
- Health Grades (web-based physician evaluation)
- Population statistics

WHY CARE ???

- Cost of health care is rising.
- Increased morbidity means increased cost.
- Hospitals are looking to margins.
- Competition is increasing.
- Payers are using population statistics.
- It is the right thing to do!

CMS Centers for Medicare & Medicaid Services

MEDICARE "PAY FOR PERFORMANCE" INITIATIVES

- **Medicare, Medicaid, and SCHIP Benefits**

  Improvement and Protection Act of 2000 (BIPA), this was the first pay-for-performance initiative for physicians under the Medicare program

- **Affordable Care Act**:
  - Hospital Value-Based Purchasing
  - PQRS Program

SIX SIGMA

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability

MEASURE

ANALYZE

IMPROVE

CONTROL

A POPULATION; NEONATES: A PLACE TO START

- Small controlled number of high volume diagnoses, in a well-defined **population**
- Data retrievable.
- Benchmarking available.
- Evidence-Based Medicine available.

SIX SIGMA

- **MEASURE**: **Data collection** available via advanced software and **clear definitions of disease state**
- **ANALYZE**: Large **international benchmarking and analysis** – Vermont Oxford (premature infants)
- **IMPROVE:** **Clinical Guidelines** found in multiple areas
- **CONTROL:** (CQI) **continuous monitoring** and evaluation of MDs

METASOFT
MetaSoft Systems, Inc.

NEODATA .....

- Consistent terminology, standard formatting, and increased legibility of documentation;
- Improved tracking of data and management plans for a population;
- Data analysis using the built-in Query and Report module;
- Support for billing operations;
- Significant time savings.

VERMONT OXFORD NETWORK

The mission of the Vermont Oxford Network is to improve the quality and safety of medical care for newborn infants and their families through a coordinated program of research, education and quality improvement projects.

The Vermont Oxford Network is a non-profit voluntary collaboration of health care professionals dedicated to our mission. Established in 1988, the Network is today comprised of over 600 Neonatal Intensive Care Units, predominantly in the United States and including centers in Canada, Europe, Asia, Africa, and the Middle East.

VERMONT OXFORD DATA

- All infants 1500 grams and under (a sub-population)
- All morbidities and disease states tightly defined
- All data adjusted for acuity, demographics, geography and obstetrical service
- Analysis done quarterly, yearly, and in 3-year running aggregates
- Continuous analysis available via: Internet based software: “Nightingale”

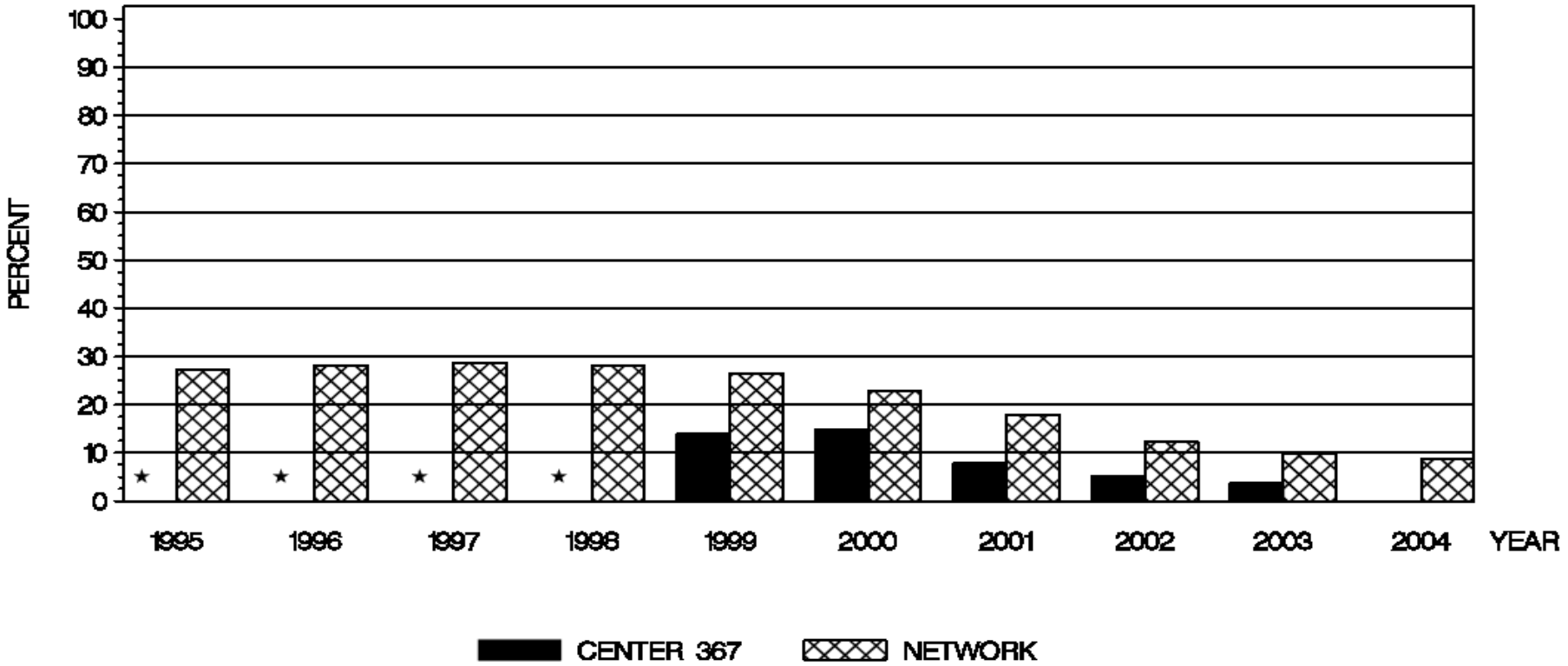
REGIONAL PERINATAL CENTER

- 35-Bed Neonatal Intensive Care Unit
- 100+ Infants a year 1500 grams or less
- Full time staff
- Computerized, “query-able” data base
- Full Service (surgery, cardiology, ophthalmology, etc.)
- Member of Vermont-Oxford since 1999
- **Multiple Clinical Guidelines in place**

TABLE 1.2
VERMONT OXFORD NETWORK
OUTCOMES FOR INFANTS 501-1500 GRAMS, CENTER 367
FOR THE THREE YEAR PERIOD 2002 TO 2004

	2002			2003			2004			2002 TO 2004				
	N	CTR 367 VALUE	BEST 25%?	N	CTR 367 VALUE	BEST 25%?	N	CTR 367 VALUE	BEST 25%?	N	CTR 367 VALUE	NETWORK VALUE	25th %TILE	75th %TILE
PNEUMOTHORAX	98	0.05		81	0.04		97	0.04		276	0.04	0.05	0.03	0.07
PVL	96	0.01	Y	76	0.05		94	0.01		266	0.02	0.03	0.01	0.04
CLD	83	0.12	Y	68	0.07	Y	82	0.09	Y	233	0.09	0.29	0.17	0.34
NEC	98	0.08		81	0.05		97	0.06		276	0.07	0.06	0.03	0.07
IVH	96	0.25		76	0.25		94	0.20		266	0.23	0.26	0.19	0.30
SEVERE IVH	96	0.07		76	0.03	Y	94	0.07		266	0.06	0.10	0.06	0.12
ROP	58	0.16	Y	56	0.43		53	0.49		167	0.35	0.41	0.27	0.51
SEVERE ROP	58	0.05	Y	56	0.11		53	0.09		167	0.08	0.10	0.05	0.13
INFECTIONS														
LATE BACTERIAL	95	0.16		75	0.13		93	0.10		263	0.13	0.11	0.06	0.14
COAG NEG STAPH	95	0.13		75	0.04	Y	93	0.12		263	0.10	0.13	0.06	0.17
NOSOCOMIAL	95	0.26		75	0.16		93	0.18		263	0.21	0.21	0.12	0.26
FUNGAL	95	0.05		75	0.01		93	0.05		263	0.04	0.02	0.00	0.03
MORTALITY	99	0.19		83	0.18		97	0.14		279	0.17	0.15	0.11	0.18
DEATH OR MORBIDITY	99	0.42	Y	83	0.39	Y	97	0.43		279	0.42	0.52	0.43	0.58

PERCENT OF STEROIDS FOR CHRONIC LUNG DISEASE INFANTS 501 TO 1500 GRAMS, CENTER 367 COMPARED TO TOTAL NETWORK 1995 TO 2004



* NOTE: NO DATA WERE RECEIVED FOR THE YEAR(S) INDICATED

FIGURE 9.10

KEY PERFORMANCE MEASURES FOR CENTER 367 2004
PERCENTILE RANKS FOR INFANTS 501 TO 1500 GRAMS

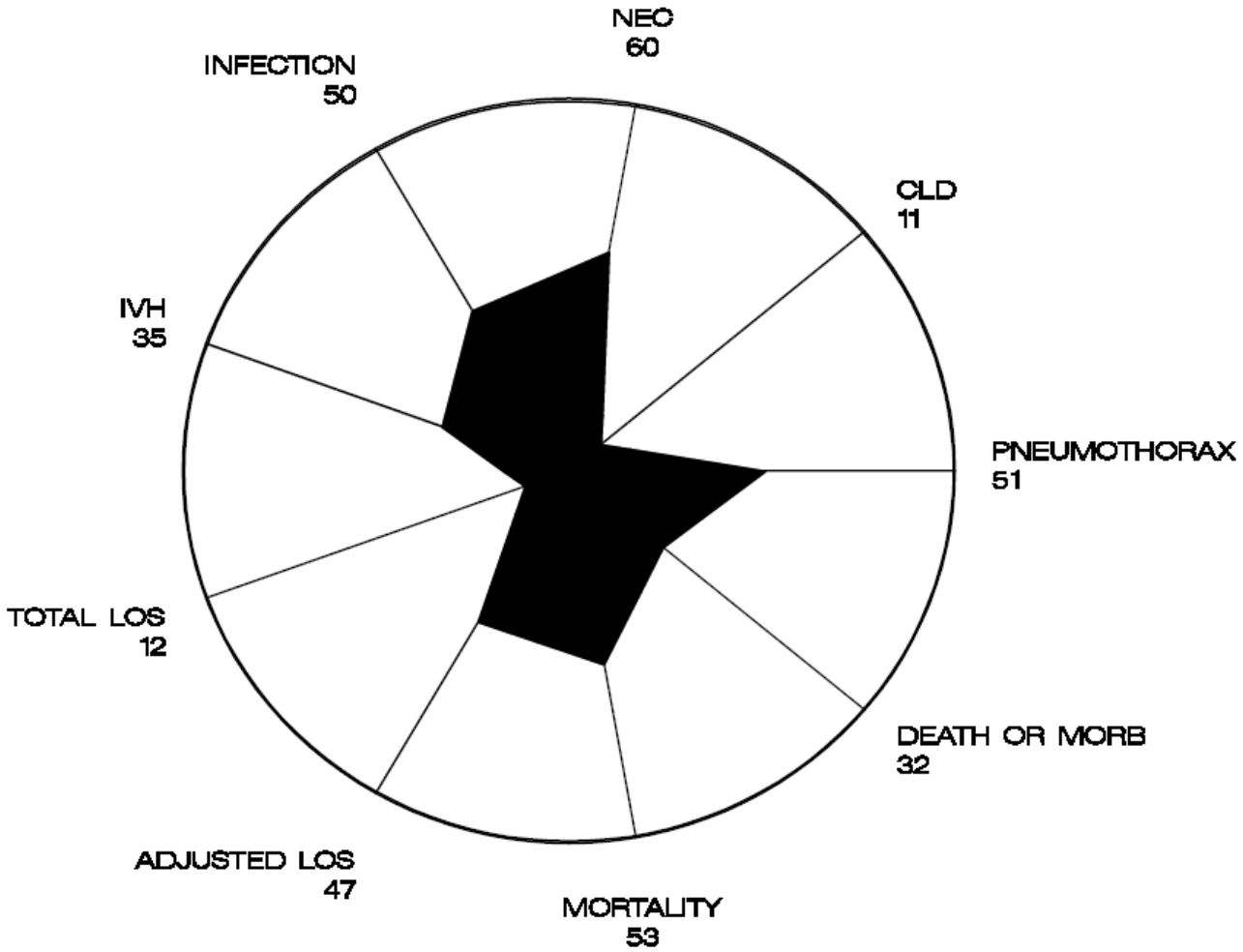


FIGURE 1.1

INFECTION: MOST SIGNIFICANT PROBLEM

INFECTIONS 2002	Center	NETWORK
Late Bacterial	16%	11%
Coag Negative Staph	13%	13%
Nosocomial	26%	21%
Fungal	5%	2%

WHAT TO DO ??

- Stress increased vigilance and “push” staff to improve adherence to present clinical guidelines?
- Review present clinical guidelines and fine tune where necessary.
- Find a “ best practice” and review their clinical guidelines and adopt their practices across the population.

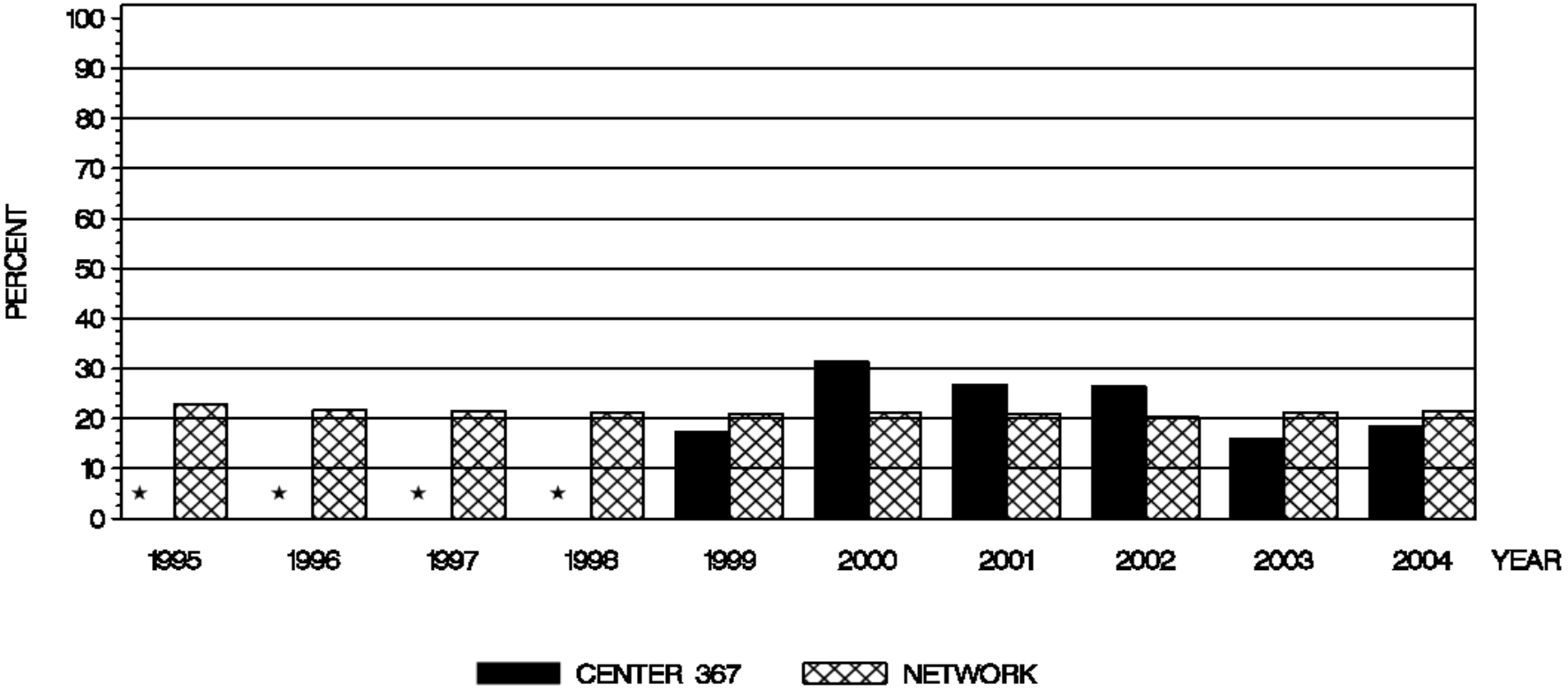
"BEST PRACTICE"

- Contacted Vermont-Oxford.
- Obtained the names of neonatal centers who had the lowest infection rates in the database.
- Adopted their clinical guidelines for infection control and continued to monitor our infection rates.

INFECTION RATE: AFTER ADOPTION OF "BEST PRACTICE GUIDELINES"

INFECTIONS 2004	MAIMOINDES	NETWORK
Late Bacterial	10%	11%
Coag Negative Staph	12%	13%
Nosocomial	18%	21%
Fungal	5%	2%

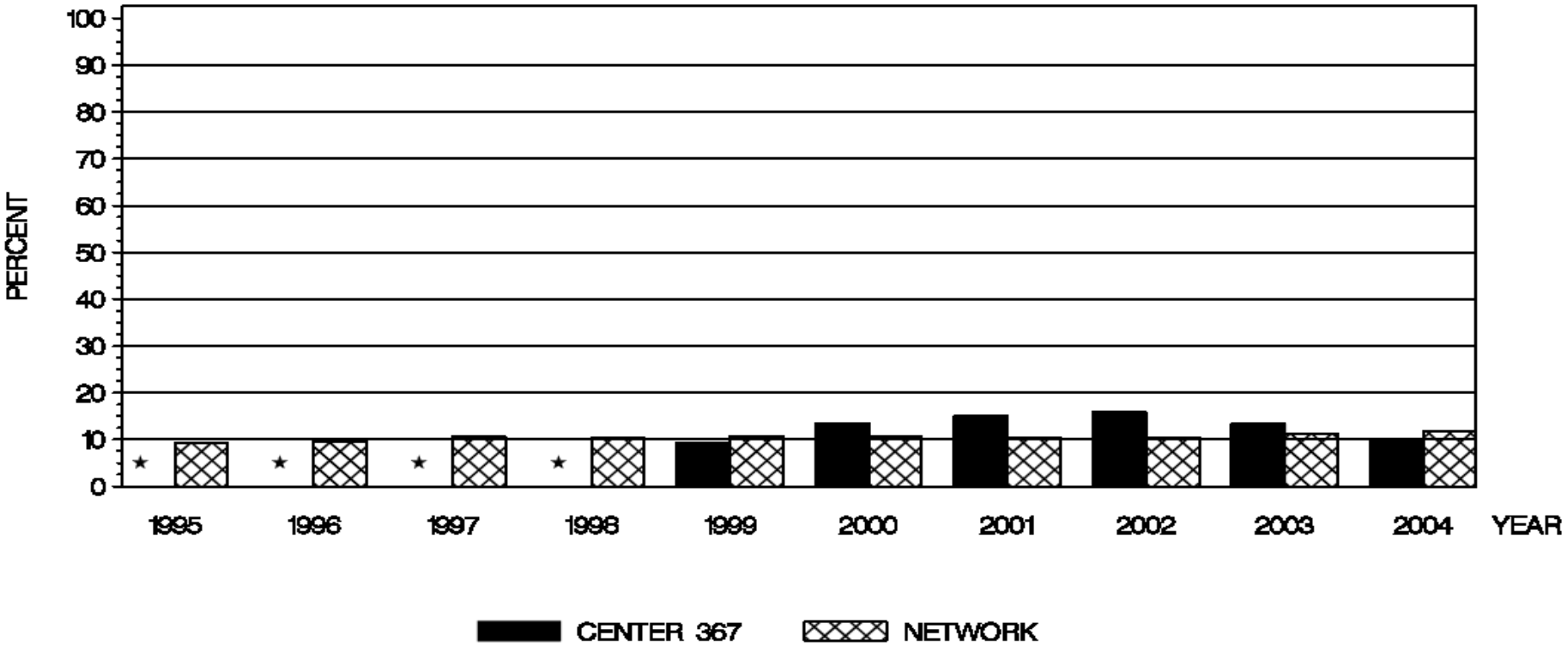
PERCENT OF NOSOCOMIAL INFECTION INFANTS 501 TO 1500 GRAMS, CENTER 367 COMPARED TO TOTAL NETWORK 1995 TO 2004



* NOTE: NO DATA WERE RECEIVED FOR THE YEAR(S) INDICATED

FIGURE 9.17

PERCENT OF LATE BACTERIAL INFECTION INFANTS 501 TO 1500 GRAMS, CENTER 367 COMPARED TO TOTAL NETWORK 1995 TO 2004



* NOTE: NO DATA WERE RECEIVED FOR THE YEAR(S) INDICATED

FIGURE 9.15

INTERNAL POPULATION BENCHMARKING

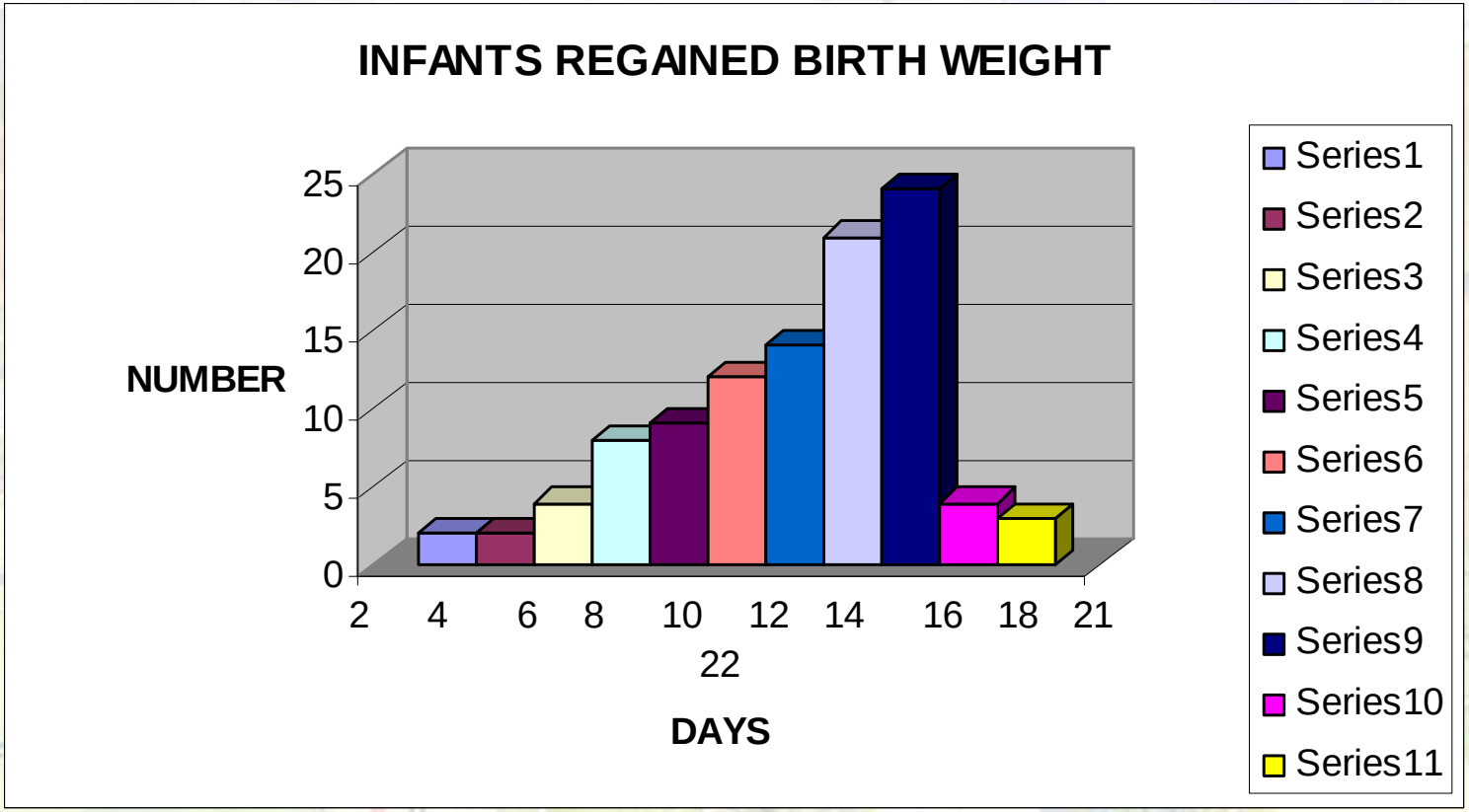
- What to do when no benchmarking data or clinical guidelines exist

1. Define the problem relative to the population
2. Use evidence-based medicine to:
   a. set internal benchmarks
   b. develop: "new clinical guidelines"
   c. internally monitor the population

DEFINE THE "PROBLEM"

- Infants under 1500 grams are not re-attaining birth weight by two weeks of age (recommendation of standard text).
- Vermont-Oxford does not track weight gain.
- No consensus on "how to feed"

INTERNAL "WEIGHT" DATA FOR 2005



WHAT IS A CLINICAL GUIDELINE?

Clinical guidelines are
systematically developed statements
designed to help practitioners and patients
make decisions about appropriate health care
for specific circumstances
across a defined population.

DEVELOPING A CLINCIAL GUIDELINE

The methods of guideline development
should ensure that
treating patients according to the guidelines
will achieve the desired population outcomes.

THE STEPS IN DEVELOPING A GUIDELINE

- Identifying and refining the subject area is the first step in developing a guideline.
- Convening and running guideline development groups is the next step.
- On the basis of systematic reviews, the group assesses the evidence about the clinical question or condition.

THE STEPS IN DEVELOPING A GUIDELINE:

continued

- This evidence is then translated into a recommendation within a clinical practice guideline.
- The last step in guideline development is external review of the guideline to ensure that you have reduced the therapeutic variation across a population.

REMEMBER !!!

- It is always better, when dealing in a “local” setting, to search the “guideline” literature for established protocols which have proven to be valid across a wide range of clinical settings, both systemically and geographically (a population).

THE RESULTING GUIDELINE

REGIONAL MEDICAL CENTER
PATIENT CARE MANUAL, NEONATAL

SUBJECT: **ENTERAL NUTRITION GUIDELINES FOR PRETERM BABIES (< 35 WEEKS OR LESS THAN 1800 g)**

DATE ISSUED: 8/23/99

DATE REVISED: 5/24/06

CROSS-REFERENCE:

- **POLICY**
- **This is a comprehensive guideline for enteral nutrition for preterm babies (<35 weeks or less than 1800 g)**

SIX SIGMA – "CONTROL"

- All infants are weighed every other day
- Weights are charted and graphed weekly
- The data is aggregated and analyzed across the population
- Each provider (MD) is peer reviewed every six months for "guideline compliance"

“Focused Peer Review”

- Every six months each physician is reviewed.
- 50 patient encounters are examined via the medical record.
- Compliance with the “feeding guideline” is judged (direct compliance or rational deviation is a positive score).
- Rational deviation is defined as non-compliance with the guideline linked to a documented reason for non-compliance in the medical record.
- Results of the review are placed in the physician’s credentialing file.

LEARNING OBJECTIVES: Have we met them ?

- What is a basic system approach to the health of a population?
- What are the key elements of such a system?
- How do those elements come together in a operational way in the clinical setting?

Thanks to all those who aided in this presentation !!