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A historic perspective and Definitions of Healthcare Associated Infections (HAI)

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Pestdrakt,
1600-tallet

The **miasmatic theory of disease**

- Diseases such as cholera, chlamydia or the Black Death were caused by a *miasma* ("pollution"), a noxious form of "bad air".
- Miasma was considered to be a poisonous vapor or mist filled with particles from decomposed matter (miasmata) that caused illnesses. It was identifiable by its foul smell.
- The miasmatic theory remained popular from the first century AD until the Middle Ages.

The germ theory of disease

- Called the **pathogenic theory of medicine**, is a theory that proposes that microorganisms are the cause of many diseases. Although highly controversial when first proposed.
- The ancient historical view was that disease was spontaneously generated instead of being created by microorganisms which grow by reproduction. The Ahtarvaveda, a sacred text of Hinduism, is one of the earliest ancient texts dealing with medicine. It identifies the causes of disease as living causative agents.

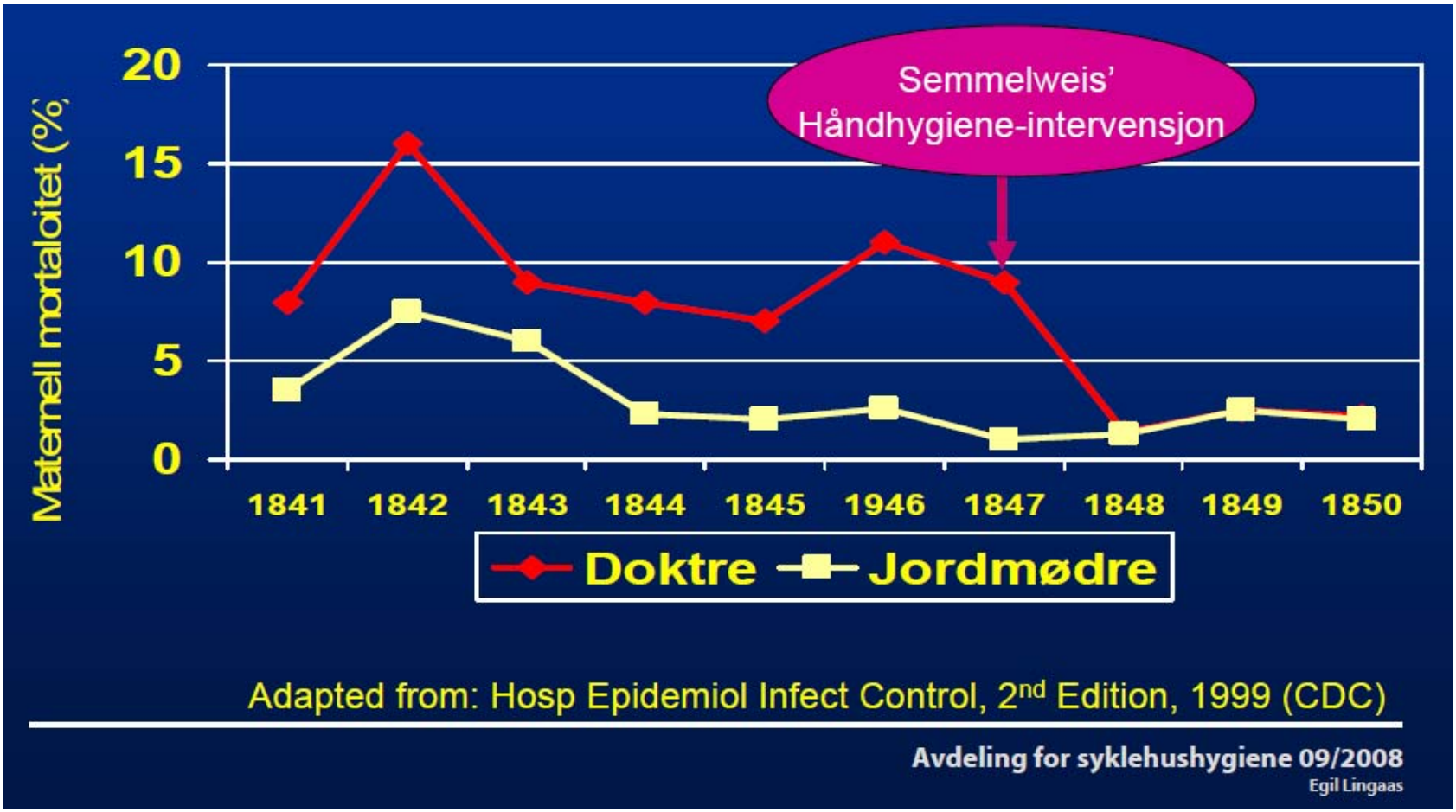
Germ Theory

- One of the earliest Western references to this latter theory appears in *On Agriculture* by Marcus T. Varro (published in 36 BC)
  - *...and because there are bred certain minute creatures which cannot be seen by the eyes, which float in the air and enter the body through the mouth and nose and there cause serious diseases*
- Frocastoro proposed in 1546 that
  - epidemic diseases are caused by transferable seed-like entities that could transmit infection by direct or indirect contact or even without contact over long distances

Historic perspective - Infection control (1)

- *1750* Sir John Pringle introduced the term antisepsis
- *1843* Oliver Wendel Holmes published ”Contagiousness of puerperal fever”
- *1846-50* Ignaz Semmerlweiss conducting studies on handhygiene and prevention of puerperal fever
- *1861* Semmerlweiss publishes ”Die Aetiologie, der Begriff und die Prophylaxis der Kindbettfiebers”
- *1861* Louis Pasteur publishes studies on fermentation of boiled fermentable fluids and exposures to air

Maternal mortality with puerperal fever, Allgemeine Krankenhaus, Austria



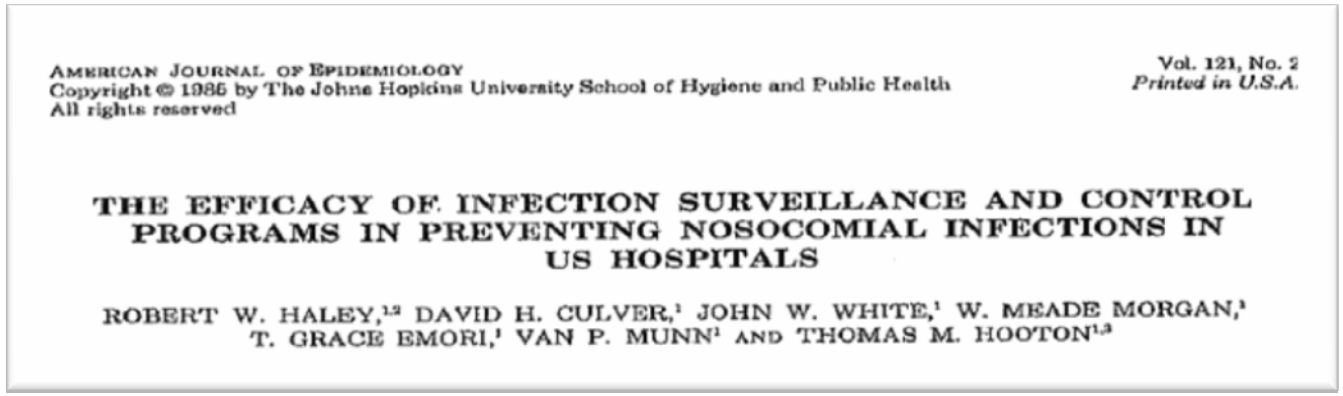
Historic perspective - Infection control (2)

- 1863 Florence Nightingale publishes ”Notes on Hospitals” – the first hospital epidemiologist
- 1867 Joseph Lister publishes work on prevention in surgery
- 1876-81 Robert Koch documents the scientific foundation of contagionism and germ theory
- 1888 Grancher introduced ”barrier precautions

Mortality after amputation

Lister 1870

Time period	Number of patients	Number of deaths	Moratlity rate
1864 – 66 Before antisepsis was introduced	35	16	46%
1867-69 After antisepsis was introduced	40	6	15%



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THE EFFICACY OF INFECTION SURVEILLANCE AND CONTROL PROGRAMS IN PREVENTING NOSOCOMIAL INFECTIONS IN US HOSPITALS

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Study on the Efficacy of Nosocomial Infection Control (SENIC)

- Initiated by Centers for Disease Control and Prevention in 1974
- To determine whether the infection surveillance and control programs established in a random sample of US hospitals had a significant influence on reducing nosocomial infections in hospitals
  - 338 representative hospitals
  - 169.256 patients included

Infection control programs (ICP)

- A program which constitutes all the necessary measures in order to
  - Prevent ”nosocomial” infections (HAI)
  - Handle the necessary follow up of such incidents
- Two main components
  - Infection prevention
  - Infection surveilance

Requirement for effective infection prevention in hospitals

- Infection control program
- Systematic infection surveillance
- One medical doctor involved in infection control
- One Infection Control Nurse ICN) per 250 hospital bed
- Systematic reporting of infection rates to surgeons

SENIC

- An effective infection control program can reduce infection rates with 30-50%
- The expenses to run such a program demands only 6 % reduction in infection rates in order to be cost-effective

Urinary tract infections

Type of infection	Specific measures	Expected reduction in Infection rates
Urinary tract infections	Surveillance Feedback of results One trained ICN per 250 hospital bed	38%

Surgical site infections (SSI)

Type of infection	Specific measures	Expected reduction in infection rates
Surgical site infections	Surveillance Systematic feedback of results Training in infection prevention measures +	20%
	Appointed IC physician	35%

Pneumonia

Infection type	Specific measures	Expected reduction in infection rates
Pneumonia in surgical wards	Surveillance Infection control program implemented Trained ICN per 250 hospital bed	27%
Pneumonia in medical wards	” Training in infection prevention measures	13%

Bloodstream infections (BSI)

Infection type	Specific measures	Expected reduction in infection rates
Bloodstream infection	Surveillance alone	15%
Bloodstream infection	Surveillance Trained ICN per 250 hospital bed Appointed IC physician	35%

Terms and concepts in Infection Control (IC)

- Nosocomial infections
- Health care associated infections
- Health care acquired infections
- Hospital acquired infections
- Cross-infections

- *CDC/NHSN surveillance definition of health care associated infection and criteria for specific types of infections in the acute care setting.*

Am J Infect Control 2008;36:309-32.

Historic development (1)

- CDC published case definitions for surveillance of *nosocomial* (HAI) infections
- 1969-72 Comprehensive Hospital Infections Project (CHIP)
- 1970-74 National Nosocomial Infections Study (NNIS)
- 1975-76 Study on the Efficacy of Nosocomial Infection Control (SENIC)
- 1988 Revisjon av NNIS definisjoner

Historic development (2)

- 1992 Update of surgical site infections (SSI)
- 1996 CDC Definitions of Nosocomial Infections
- 2001 Helics III – European definitions of HAI infections
- 2004 Update of CDC bloodstream infections (BSI) and surgical site infections (SSI)
- 2008 Update of CDC/NHSN surveillance definition of health care associated infection and criteria for specific types of infections in acute care settings

Epidemiological definitions objective

- Definitions are developed to standardise methodology in order to ensure
  - validity
  - reliability

(Case) definitions HAI

- For the purposes of NHSN surveillance in the acute care setting, the CDC defines an HAI as a *localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s). There must be no evidence that the infection was present or incubating at the time of admission to the acute care setting.*

Horan T & al. CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting, AJIC 2008

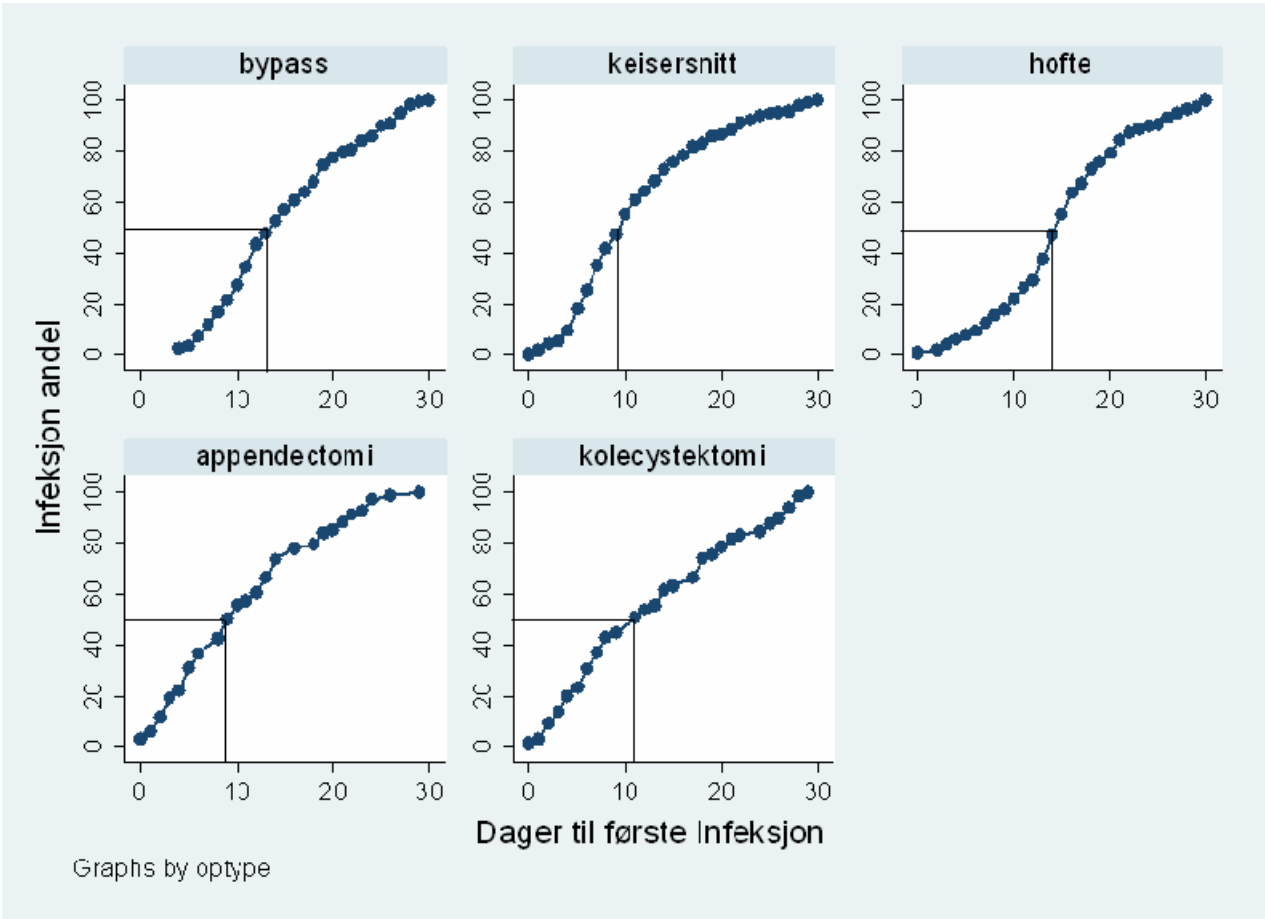
General considerations (1)

- HAIs may be caused by infectious agents from endogenous or exogenous sources.
  - Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.
  - Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the health care environment.

General considerations (2)

- Healthcare associated infections which appear postdischarge (PD) (≥ 30 days, and/or ≥ 12 months after surgery with an implantat)
- Infections in newborns after delivery and where the baby was born through the birht canal

Days to infection – 30 days follow up post discharge (PD) - 13 % of SSI appear after discharge from hospital



	Gjennomsnittl. liggetid postop. (dgr)
Bypass	6,1
Keisersnitt	4,8
Hofte	7,9
Appen-dektomi	2,7
Kolecys-tektomi	2,2

The following infections are **not** considered health care associated

- Infections associated with complications or extensions of infections already present on admission, unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection;
- Infections in infants that have been acquired transplacentally (eg, herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and become evident ≥48 hours after birth
- Reactivation of a latent infection (eg, herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis).

The following conditions are not infections:

- *Colonization*, which means the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms
- *Inflammation* that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.

Documentation

- The diagnosis of HAI will be based on a combination of clinical signs/symptoms, microbiology and other diagnostic measures
- Diagnosis should be found in medical records of the patient
- It is sufficient for a medical doctor to diagnose HAI based on direct observation of clinical signs/sypmtoms, and direct observation during intervention procedures (surgery, endoscopi or other).

McGeer surveillance definitions

American Journal of Infection Control

Volume 19 Number 1 February 1991

COMMENTARY

Definitions of infection for surveillance in long-term care facilities

Long Term Care Facilities (LTCF)

- It has become clear that much more data on rates, risk factors, and management of infections in residents of such facilities are needed if the quality of resident care and the cost-effectiveness of infection control programs are to be optimized.
- Standard definitions of HAI developed for use in acute care hospitals are **not** applicable in most long-term care facilities.

Surveillance of elderly - - special medical considerations

- Elderly are have an increased risk for HAI because of debilitating factors because of:
  - Age/immunological conditions
  - Medical conditions
  - Immunosuppression
  - Medication
  - Nutrition status
- Clinical signs/symptoms are expressed differently
- Diagnostic tools not available

Surveillance definitions –LTCF's

- Few studies have applied standardised definitions and methodology
- Surveillance data were perceived not to be important to the respondents
- The questions were not relevant to the study population

Goldrick BA. Infect Control&Hosp Epidem, 1999;20:764-9
Strasbaugh LJ. Infect Control&Hosp Epidemiol 2000;21:674

Future challenges

- Microorganisms – virulens and resistance
- Infectious diseases - changes in/new infectious diseases
- Patients – resistance, environmental and social changes
- Hospitals – organisational and structural changes, economy
- New diagnostics, new medication
- Competencies, skills, behaviour in healthcare professions
- Politics, media, business, economy
- Ecology