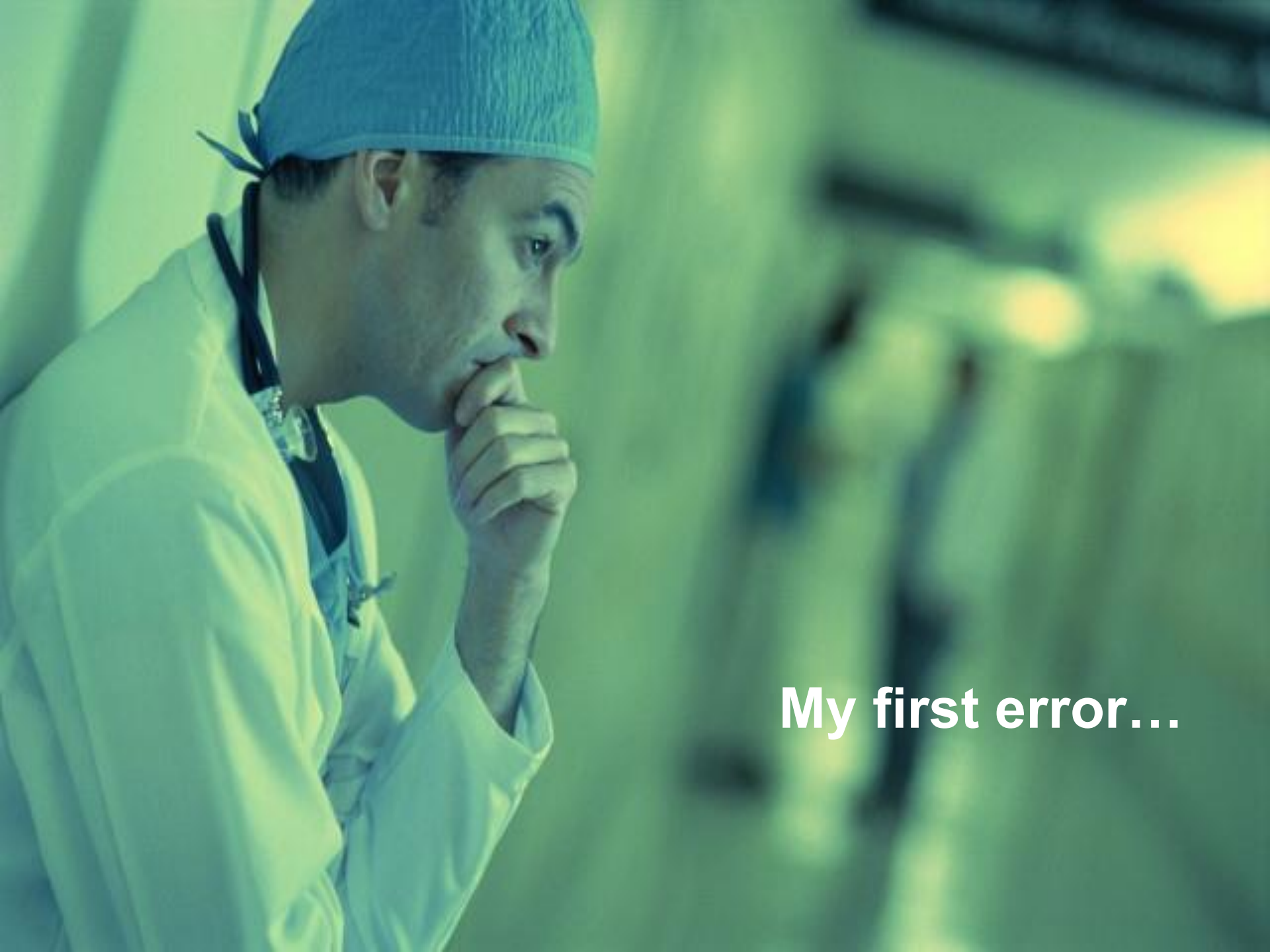
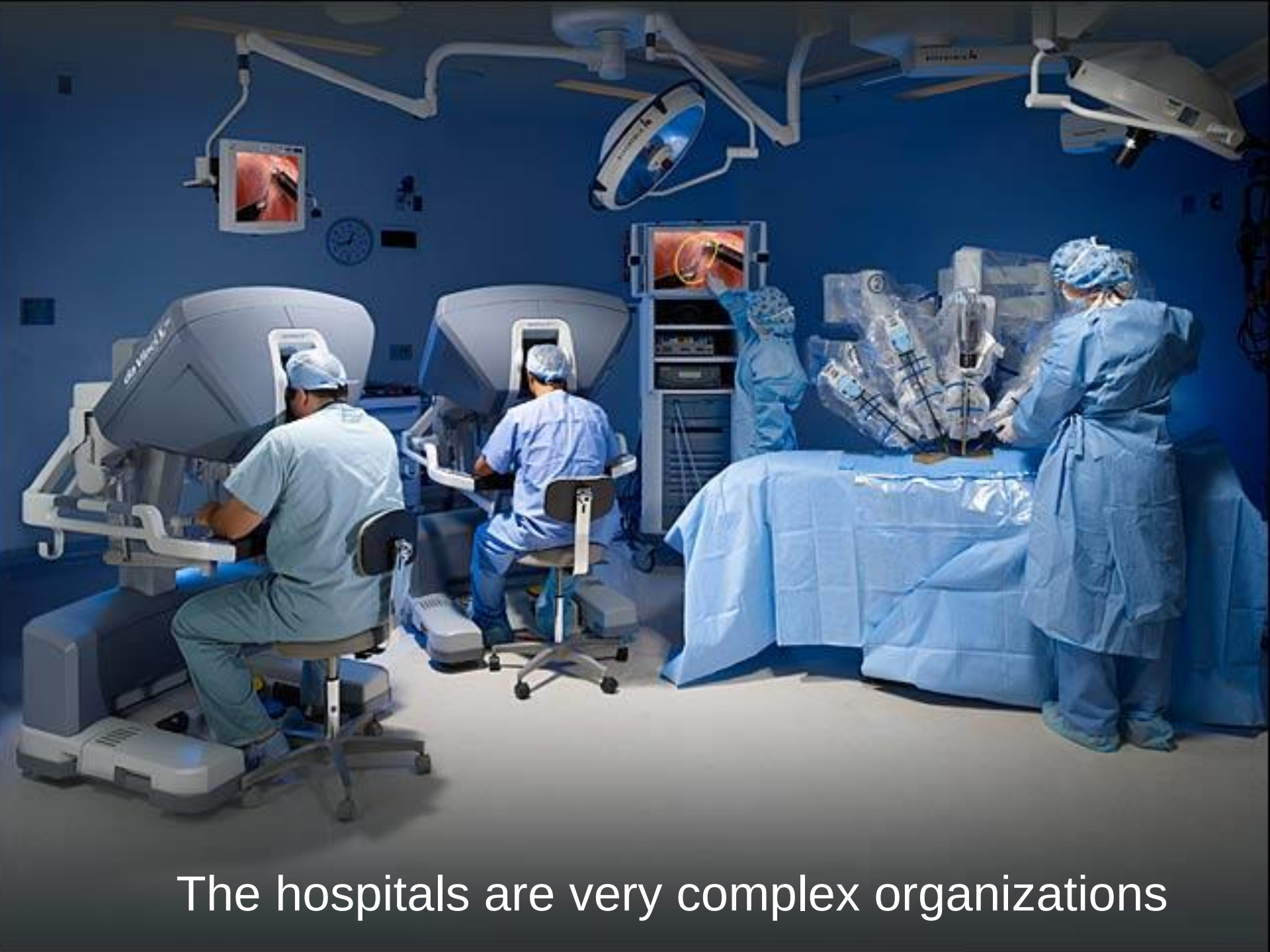
Diagnostic errors

Luís Campos
luisbarretocampos@gmail.com

Riga, 19th February 2017

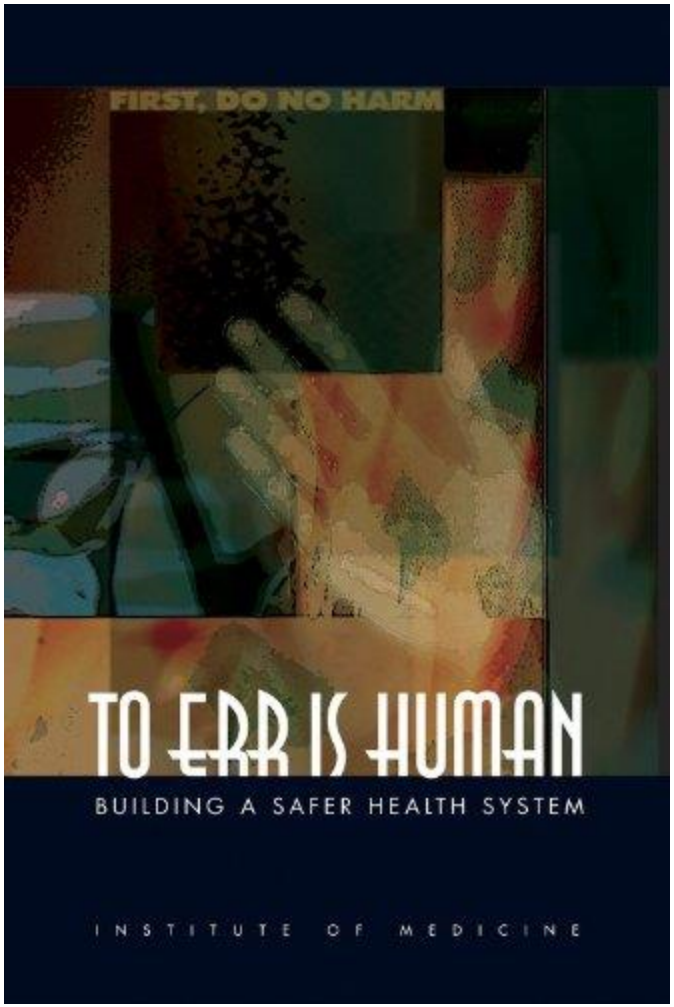

My first error…



The hospitals are very complex organizations

Errors in judgment must occur in the practice of an art which consists largely in balancing probabilities…

Sir William Osler (1849-1920)



44.000 to 98.000 Americans die every year from medical errors.

Institute of Medicine.

To Err is Human: National Academy Press, 2000

Hospitals are dangerous places ...

Risk of death due to error or accident ..

1: 300

1: 6.000.000

25-Year summary of US malpractice claims for diagnostic errors 1986–2010: an analysis from the National Practitioner Data Bank

Ali S Saber Tehrani,[1] HeeWon Lee,[2] Simon C Mathews,[2]
Andrew Shore,[3] Martin A Makary,[3] Peter J Pronovost,[4]
David E Newman-Toker[1]

Tehrani ASS, et al. Quality and Safety in Healthcare 2013;0:1-9 doi: 10.1136

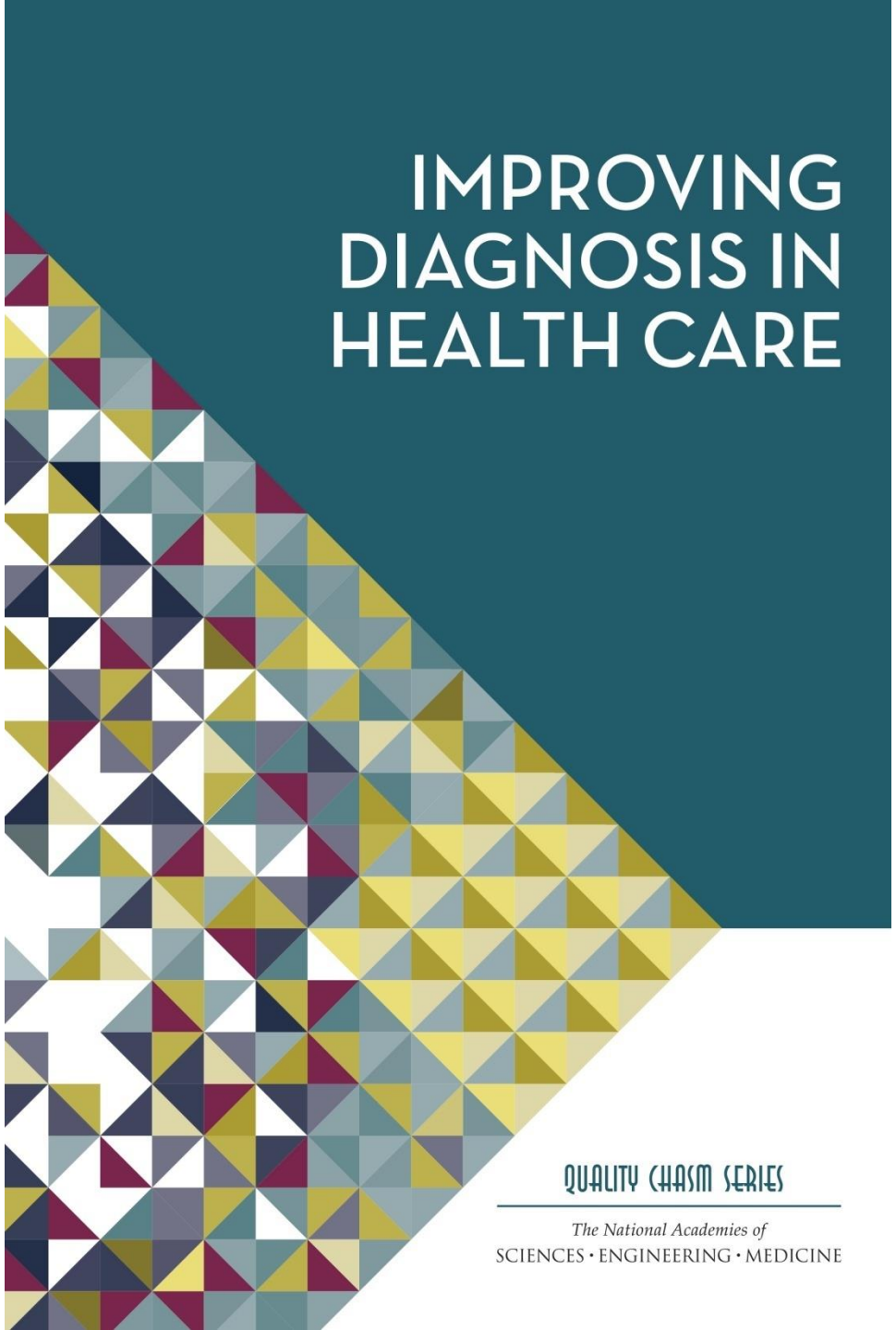
Compensation for medical malpractice in the US (1986-2010) N = 350 706

- **Diagnostic errors** are the most common cause of claims (28.6%), the largest volume (35.2%) and those who more lead to death (40.9% vs. 20.9%).

- In recent years **the amount of compensation** for misdiagnosis was $ 38.8 billion (Average = $ 386,849).

- **The most frequent diagnostic errors** are the lost diagnoses (54.2%) and occur in outpatient setting (68.8% vs. 31.2%).

Tehrani ASS, et al. Quality and Safety in Healthcare 2013;0:1-9 doi: 10.1136


IMPROVING
DIAGNOSIS IN
HEALTH CARE
QUALITY CHASM SERIES
The National Academies of
SCIENCES • ENGINEERING • MEDICINE

1. What is a diagnostic error?
2. How often diagnostic errors occur?
3. Why doctors fail the diagnosis?
4. What can we do to prevent diagnostic errors?

1

What is a diagnostic error?

Diagnostic errors definition

Missed opportunities to make a correct or timely diagnosis based on the available evidence, regardless of patient harm

H Singh, 2014

The failure to (a) establish an accurate and timely explanation of the patient's health problem(s) or (b) communicate that explanation to the patient.

IOM, 2015

Singh H. Editorial: Helping Health Care Organizations to Define Diagnostic Errors as Missed Opportunities in Diagnosis. Jt Comm J Qual Patient Saf 2014;40:99–101.
National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*

What are diagnostic errors?

- Misdiagnosis
- Missed diagnosis
- Delayed diagnosis
- Error in assessing the severity
- Failure to detect complications

2

How often medical errors occur?

The variable epidemiology of medical error

- Autopsies
- Physician report
- Patient report/ complaints
- Chart audits
- Trigger tools
- Malpractice claims
- Indicators monitorization

The incidence of diagnostic error

- Diagnostic error account for 6 to 17% of hospital adverse events
- In the US 10 million adults are estimated to be misdiagnosed annualy in outpatient settings (5%)
- Diagnostic errors contribute to approximately 10 percent of patient deaths

Graber ML. BMJ Qual Saf 2013;22(Suppl 2):ii21–7. Singh H, Meyer AN, Thomas EJ. BMJ Qual Saf 2014;23:727-31. National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*

ORIGINAL INVESTIGATION

HEALTH CARE REFORM

Diagnostic Error in Medicine

Analysis of 583 Physician-Reported Errors

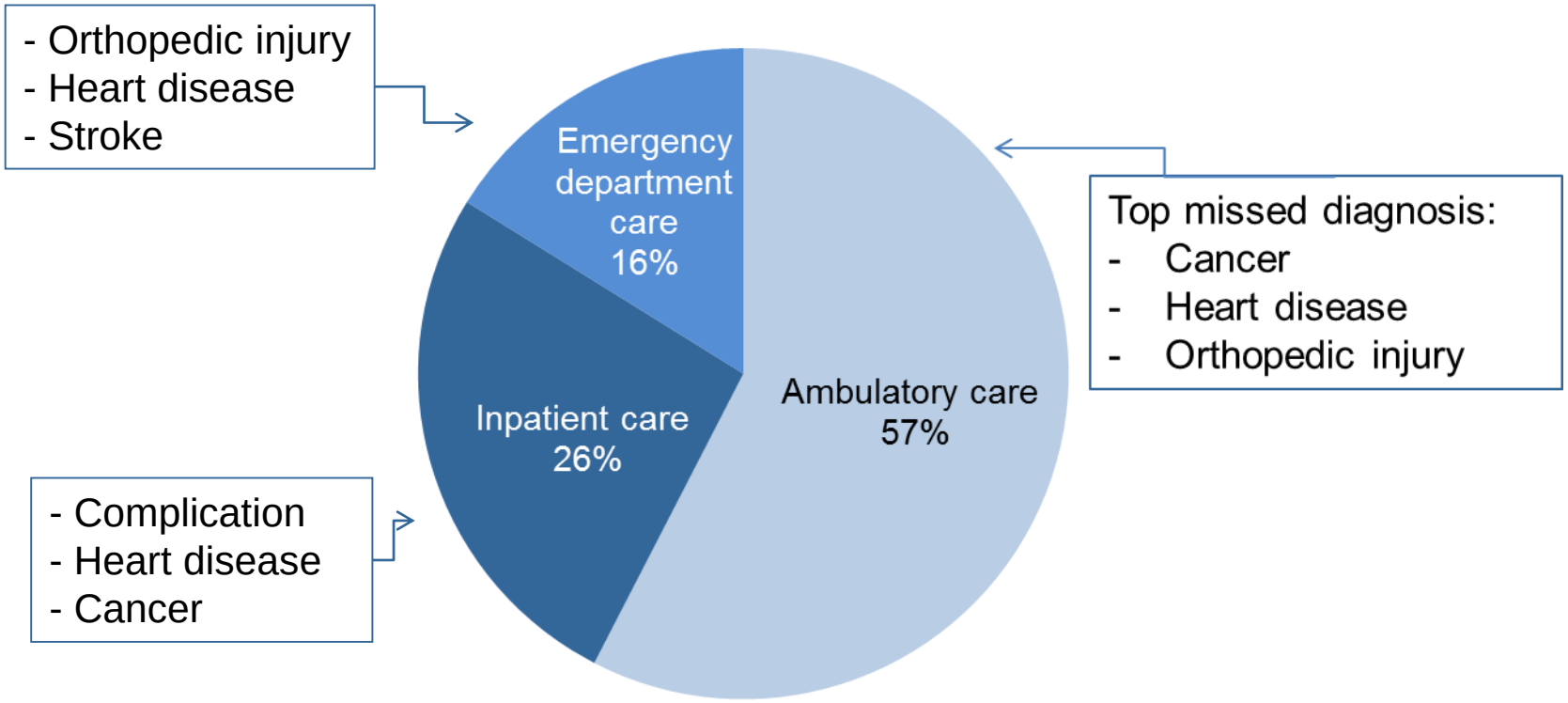
Gordon D. Schiff, MD; Omar Hasan, MD; Seijeoung Kim, RN, PhD; Richard Abrams, MD; Karen Cosby, MD; Bruce L. Lambert, PhD; Arthur S. Elstein, PhD; Scott Hasler, MD; Martin L. Kabongo, MD; Nela Krosnjar; Richard Odwazny, MBA; Mary F. Wisniewski, RN; Robert A. McNutt, MD

- Pulmonary Embolism (4,5%),
- Drug reactions or overdose (4,5%)
- Lung Cancer (3,9%)
- Colorectal cancer (3,3%)
- Acute coronary syndrome (3,1%)
- Breast cancer (3,1%)
- Stroke (2,6%)

Schiff GD et al. *Arch Intern Med* 2009; 169: 1881-1887

Diagnostic malpractice cases in the US per type of care

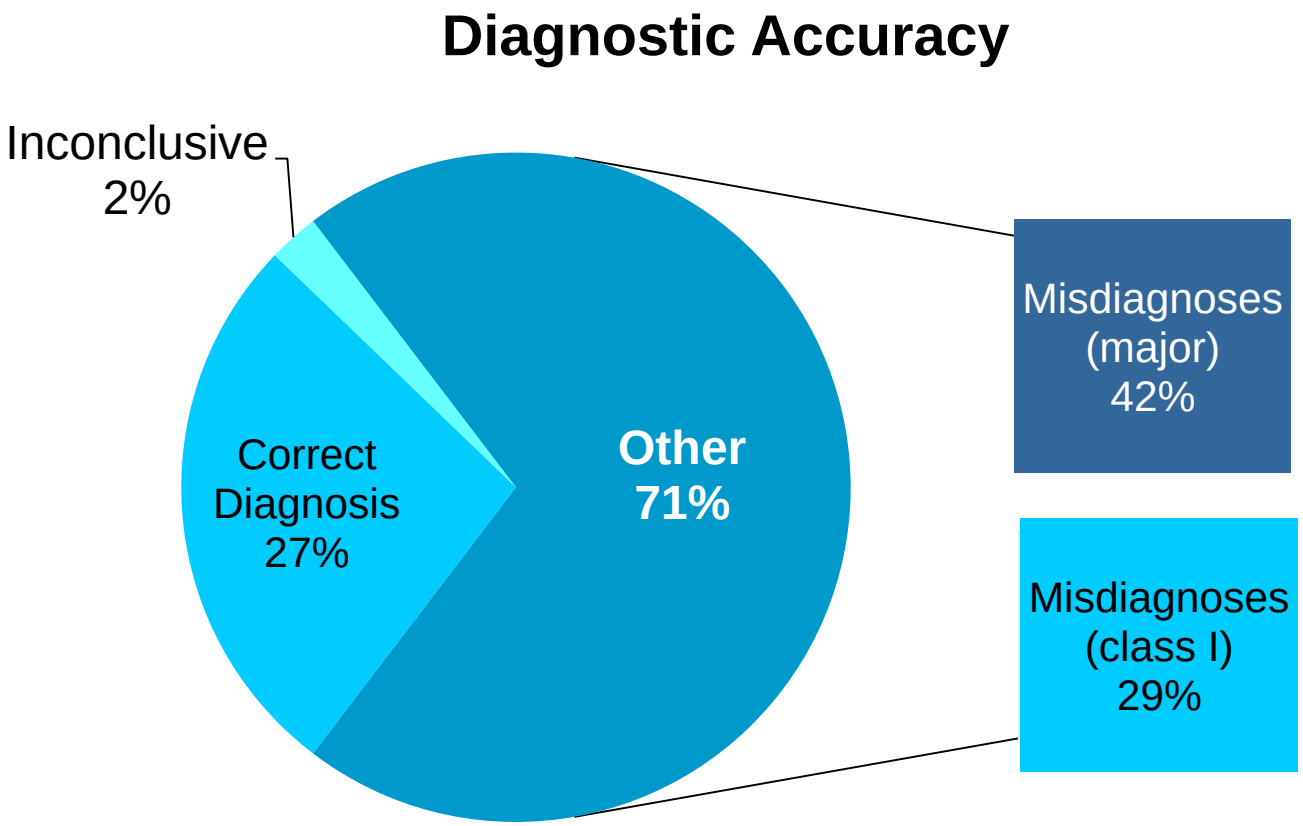
(4703 cases 2008-2012)



CRICO, 2015. 2014 Annual Benchmarking Report. Malpractice risks in the diagnostic process.

Clinical Autopsies in ER of a Central Hospital

54 autopsies in 885 deaths (2003-2005)

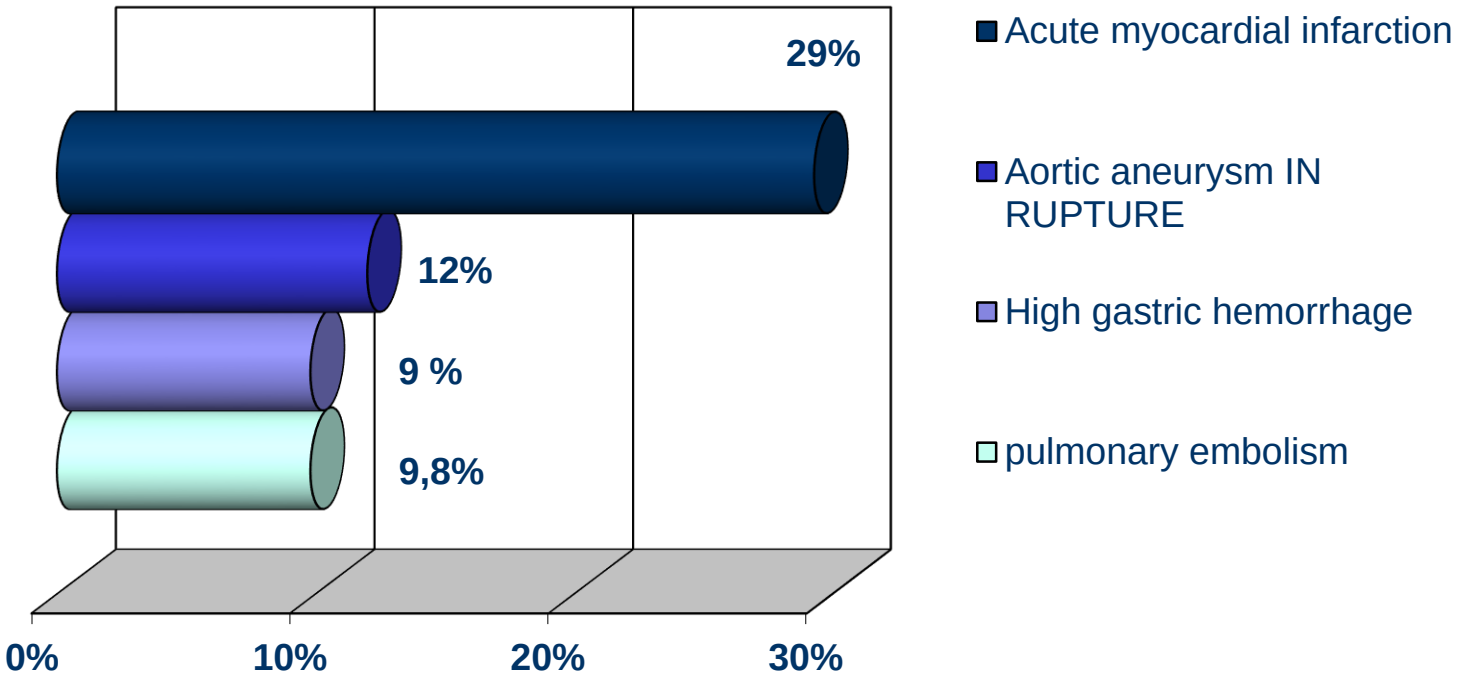


M. Monteiro, L Campos. 11º Congresso Nacional de Medicina Interna, 2005

Clinical autopsies in ED of a central hospital

54 autopsies in 885 deaths (2003-2005)

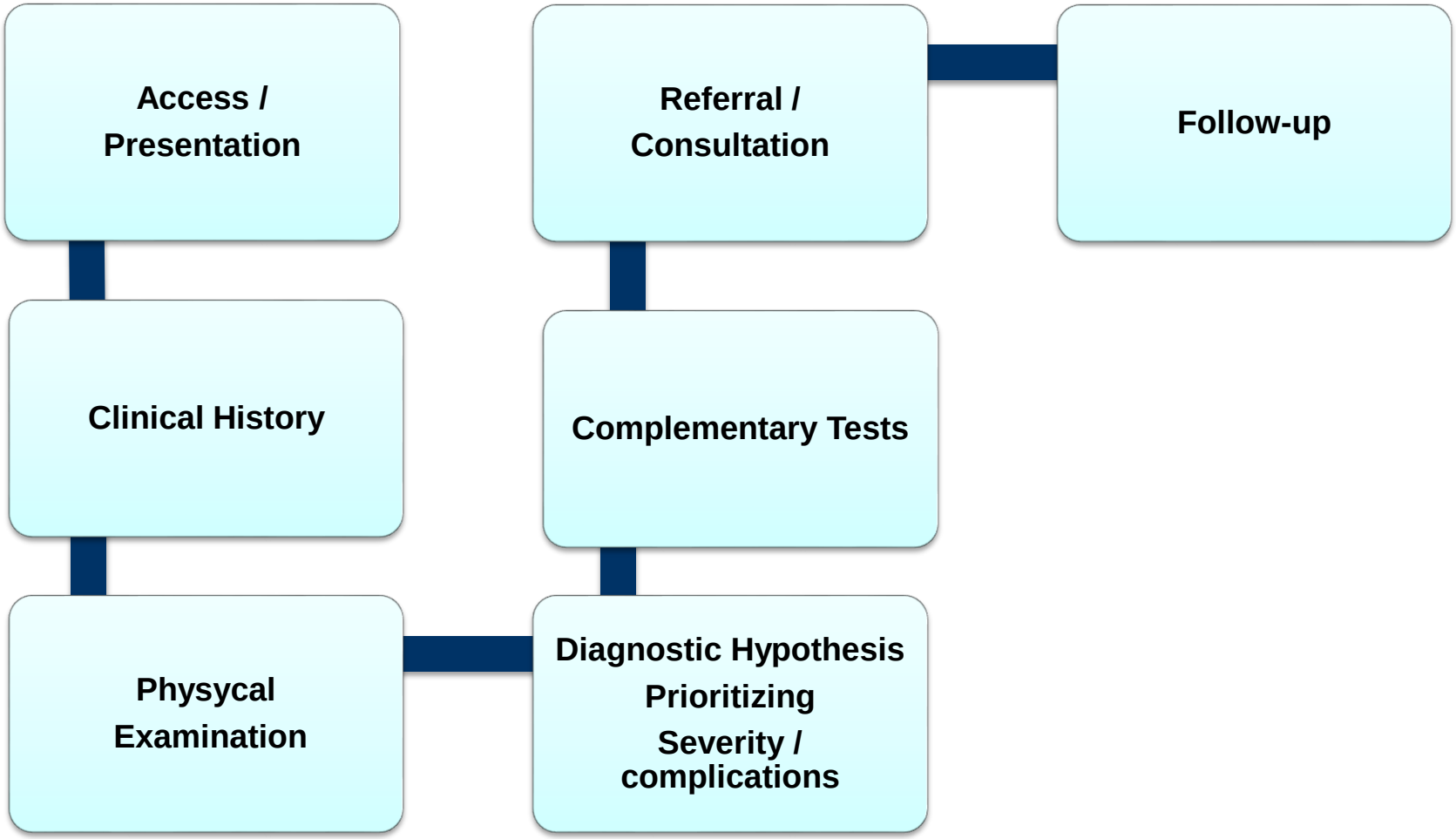
Most frequent post-mortem diagnosis



M. Monteiro, L Campos, 11º Congresso Nacional de Medicina Interna, 2005

Where in the diagnostic process errors occur?

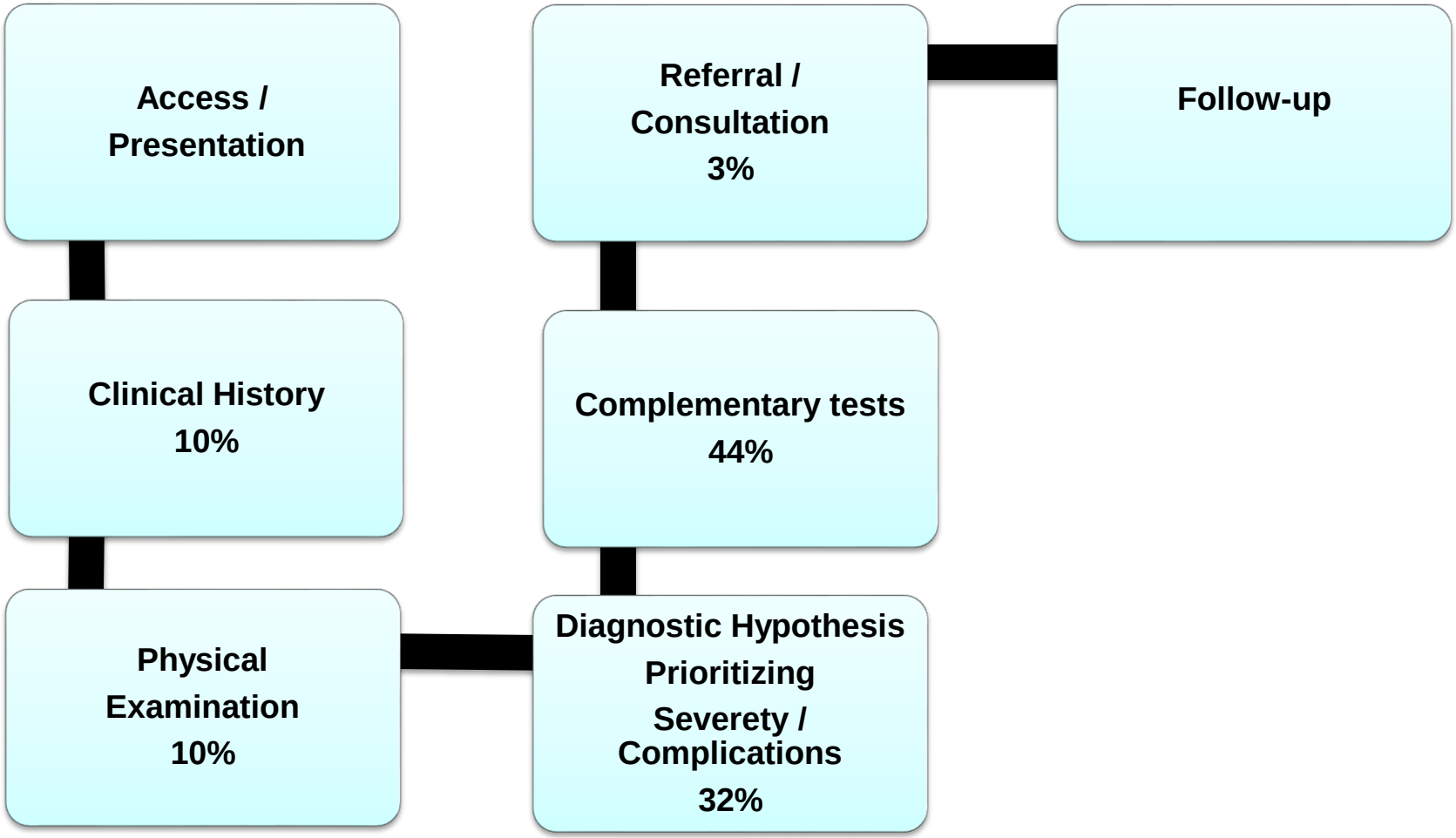
Error Diagnostic Evaluation and Research (DEER)



Schiff GD et al. *Arch Intern Med* 2009; 169: 1881-1887

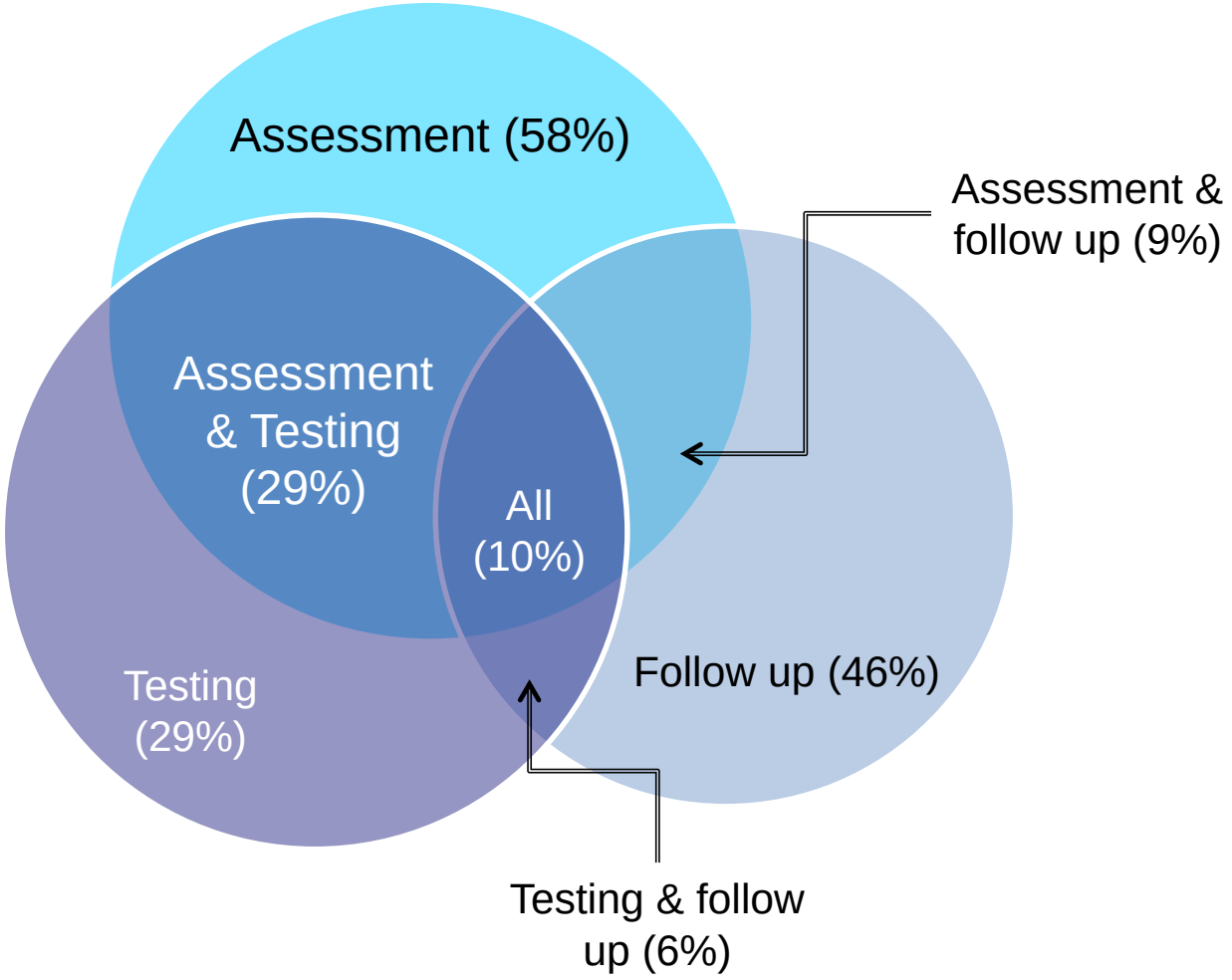
Where in the diagnostic process errors occur?

Analysis of 583 physicians-reported diagnostic errors

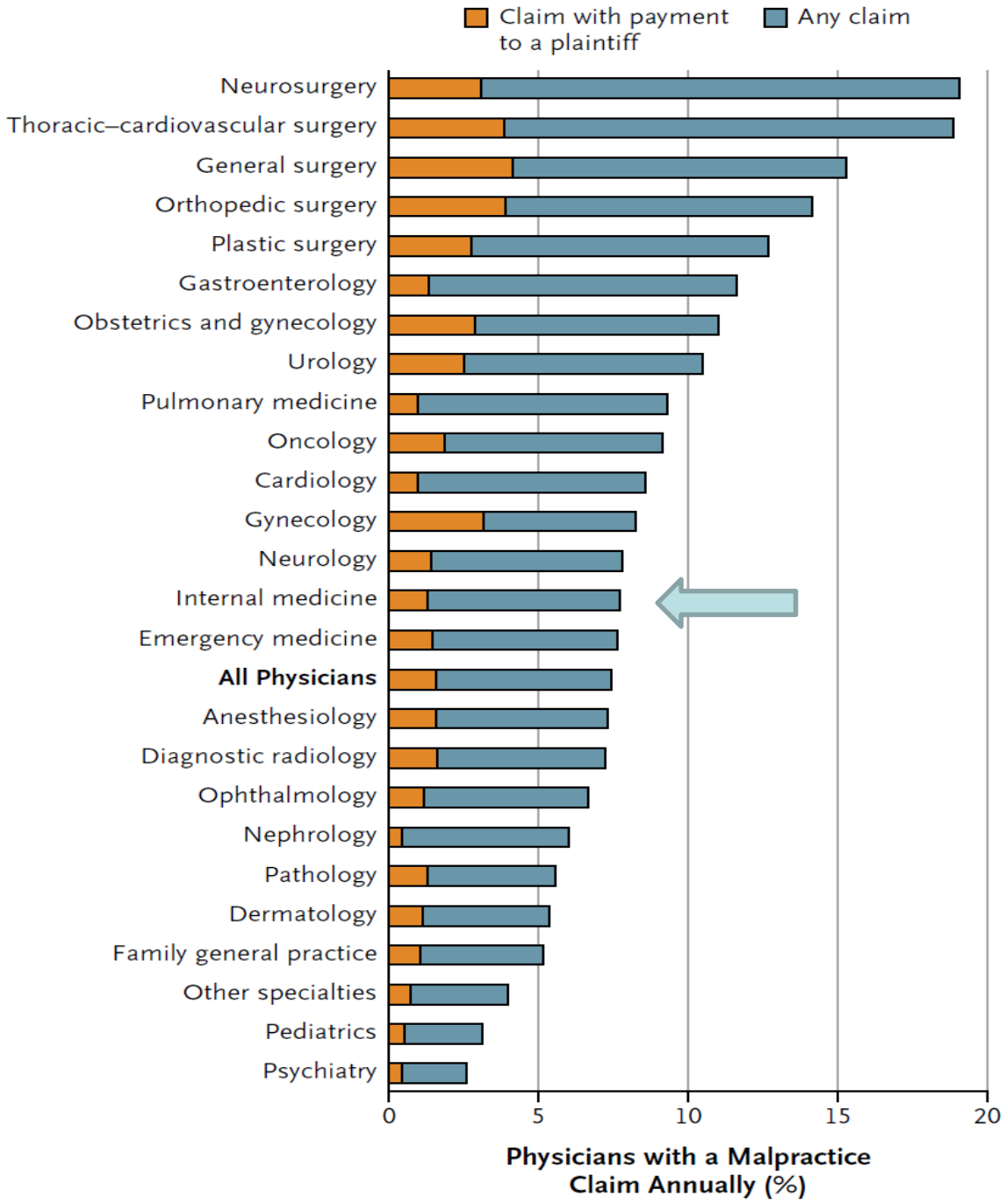


Schiff GD et al. *Arch Intern Med* 2009; 169: 1881-1887

Overlap of errors in individual cases



CRICO, 2015. 2014 Annual Benchmarking Report. Malpractice risks in the diagnostic process.



Physicians facing a malpractice claim annually, according to the specialty (1991-2005)

Jena AB. NEJM 2011; 365: 629-36

3

Why doctors fail the diagnosis?

The case of Thomas Duncan…

Thomas Duncan, a liberian man, went to the emergency room of the Texas Health Presbyterian Hospital, on the 25th September 2014, complaining of fever, dizziness, nausea, abdominal pain, a sharp headache, and decreased urination. The nurse recorded in the EHR a recent travel from Liberia. Head and abdomen CT scan were normal. He was sent away with antibiotics and a diagnosis of sinusitis.

He returned two days later and was admitted.

The patient passed away on October 8.

KERA NEWS

Listen Live | Don

HOME | TELEVISION | RADIO | NEWS | ART&SEEK | KIDS AND FAMILY | KXT 91.7 | ABOUT | SEARCH

Dallas Patient Told Hospital During First Visit He Was Visiting From Liberia

By ERIC AASEN, DOUALY XAYKAOTHAO & ASSOCIATED PRESS • OCT 1, 2014

SHARE
Twitter
Facebook
Google+
Email

Gov. Rick Perry spoke at Texas Health Presbyterian Hospital in Dallas on Wednesday.

DOUALY XAYKAOTHAO KERA NEWS

SECTIONS | SEARCH

Los Angeles Times

SUBSCRIBE | LOG IN

WEDNESDAY OCT. 7, 2015 | MOST POPULAR | LOCAL | ENTERTAINMENT | SPORTS | POLITICS | OPINION | GREAT READS | PLACE AN AD | 77°

Nation / Nation Now

Error in Dallas may have exposed others to Ebola, CDC chief says

The breach in protocol that allowed Texas nurse Nina Pham (inset) to contract Ebola may have exposed others. (Associated Press / Getty Images)

Molly Hennessy-Fiske and Tina Susman · Contact Reporters

SHARE THIS

Related Coverage


Ebola in the United States
Oct. 12, 2014


Related story: New Ebola case in Texas raises worries about U.S. health system
Oct. 13, 2014


Ebola in the United States
Oct. 11, 2014

See More

In Case You Missed It


Judge blocks disposal of Ebola victim's burned belongings in

ACTION NEWS
WPVI-TV PHILADELPHIA, PA

55° Philadelphia, PA
CLEAR EDIT

SECTIONS | TRAFFIC | VIDEO | Philadelphia | Pennsylvania | New Jersey | Delaware

HEALTH & FITNESS

US EBOLA PATIENT DIES; AIRPORT SCREENING EXPANDED

A Dallas hospital spokesman says the first Ebola patient diagnosed in the United States has died.

RELATED


What is the Ebola virus? 6 things you should know

HEALTH & FITNESS


Chat with Penn Medicine about Advanced Lung Disease Treatment Options


NJ cancer patient says she was humiliated by drivers license photo


Nurse giving flu shots reused syringes in Mercer Co.


New study on nutritional value of whole milk

SECTIONS | SEARCH

Los Angeles Times

SUBSCRIBE | LOG IN

WEDNESDAY OCT. 7, 2015 | MOST POPULAR | LOCAL | ENTERTAINMENT | SPORTS | POLITICS | OPINION | GREAT READS | PLACE AN AD | 77°

Nation

Related story: New Ebola case in Texas raises worries about U.S. health system

A worker in a protective hazmat suit walks in front of an east Dallas apartment building where a second person diagnosed with the Ebola virus lives. Cleaning crews decontaminated the lawn and surrounding area after the healthcare worker was isolated at a local hospital. (Mike Stone / Getty Images)

Noam N. Levey, Molly Hennessy-Fiske and Kurtis Lee · Contact Reporters

Related Coverage


Ebola in the United States
Oct. 12, 2014

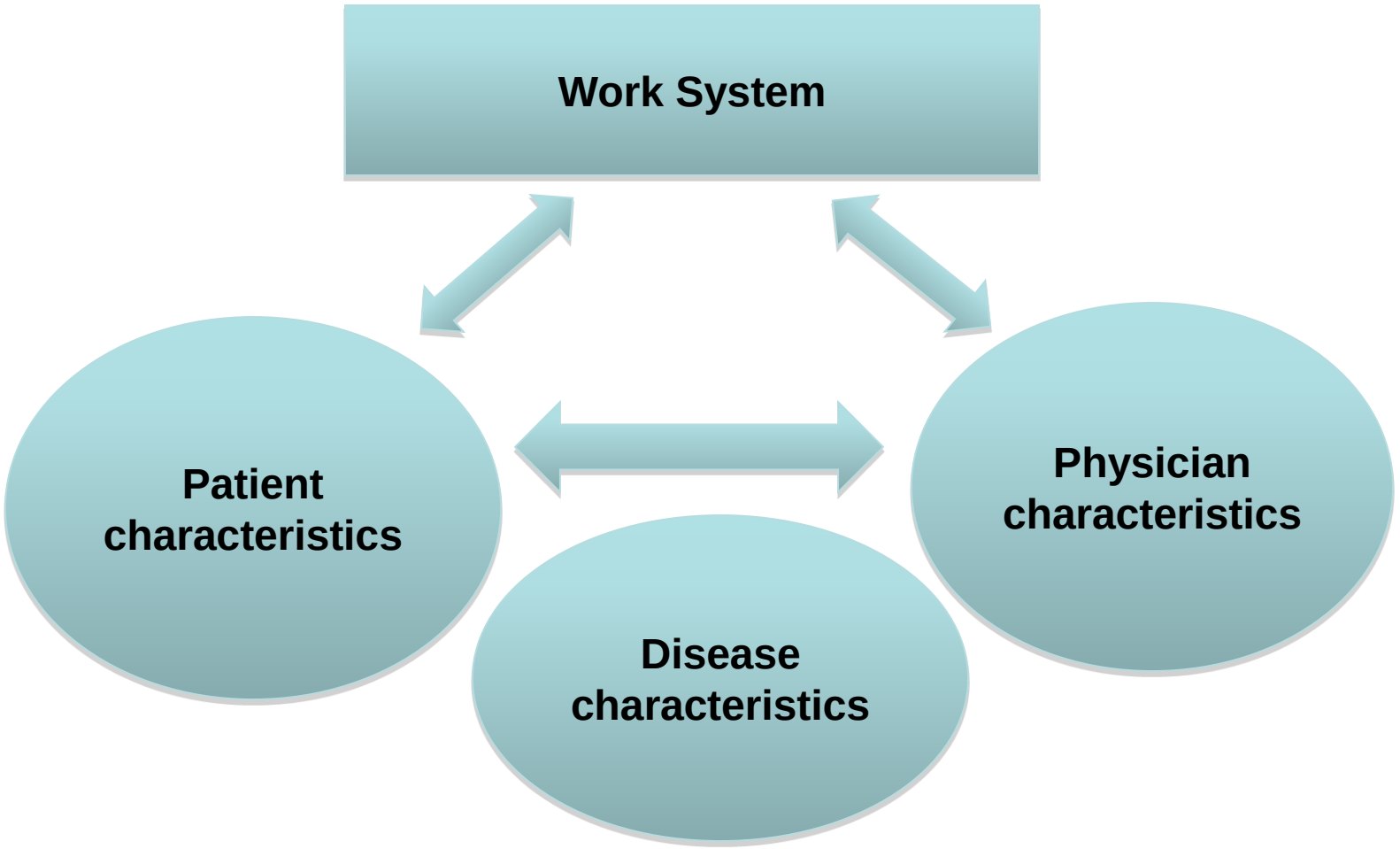

Second Texas Ebola patient
Oct. 12, 2014


Related: Ebola research: Fever not a surefire sign of infection
Oct. 12, 2014

In Case You Missed It


Confronting Ebola
Oct. 18, 2014

Determinants of diagnostic error



Causes of diagnostic errors

- No-fault errors

  (Masked or unusual presentation of disease, patient-related errors)

- System-related errors

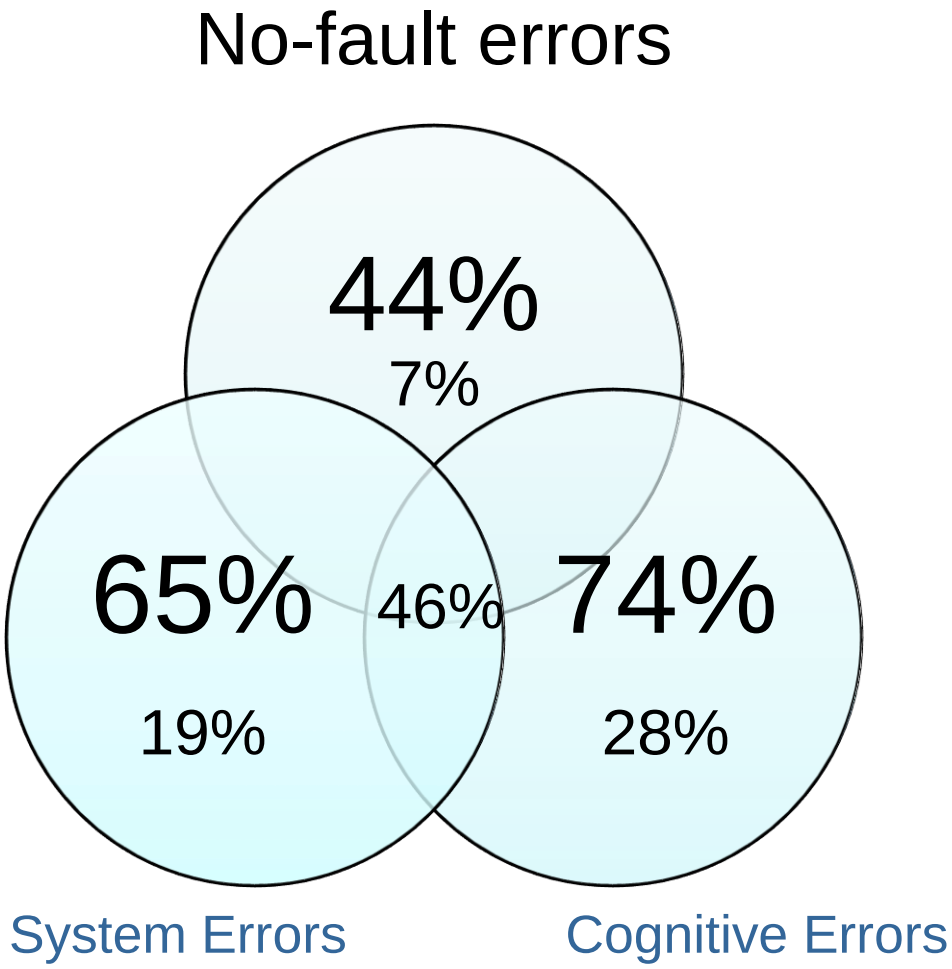
  (technical failures, equipment problems or organization flaws)

- Cognitive errors

  (Faulty knowledge, faulty data gathering or faulty synthesis)

(Graber ML et al. *Arch Intern Med* 2005; 165:1493-1499)

Category of factors contributing to diagnostic errors in Internal Medicine



On average 5.9 factors per case have been reported

(Graber ML et al. *Arch Intern Med* 2005; 165:1493-1499)

No-fault errors

- 30-40% of what we do, have no evidence to support it
- Not yet identified or difficult to define diseases, atypical cases, overlap syndromes, undifferentiated presentations
- Gestures and findings in physical examination that have low sensitivity and specificity
- Complementary tests with low sensitivity and specificity

Patients referred to a tertiary rheumatology clinic for a positive ANA test (232 pts)

Reported ANA Titer	No. of Patients	No. of Patients with AARD (and Specific Diagnoses)
≥1:40 (and <1:80)	27	0
≥1:80 (and <1:160)	28	0
≥1:160 (and <1:320)	71	1 (SLE)
≥1:320 (and <1:640)	34	1 (SjS)
≥1:640 (and <1:1280)	31	4 (2 SLE, 2 SjS)
≥1:1280 (and <1:2560)	23	8 (2 SLE, 4 SjS, 1 SSc, 1 UCTD)
≥1:2560 (and <1:5120)	6	2 (1 SSc, 1 SjS)
≥1:5120	7	4 (1 MCTD, 1 SSc, 2 SjS)
No titer	5	1 (UCTD)

Abeles AM et al. Am J Med 2013; 1126:342-348

When it is patient’s fault ...

Choose the specialist and you will choose the disease...

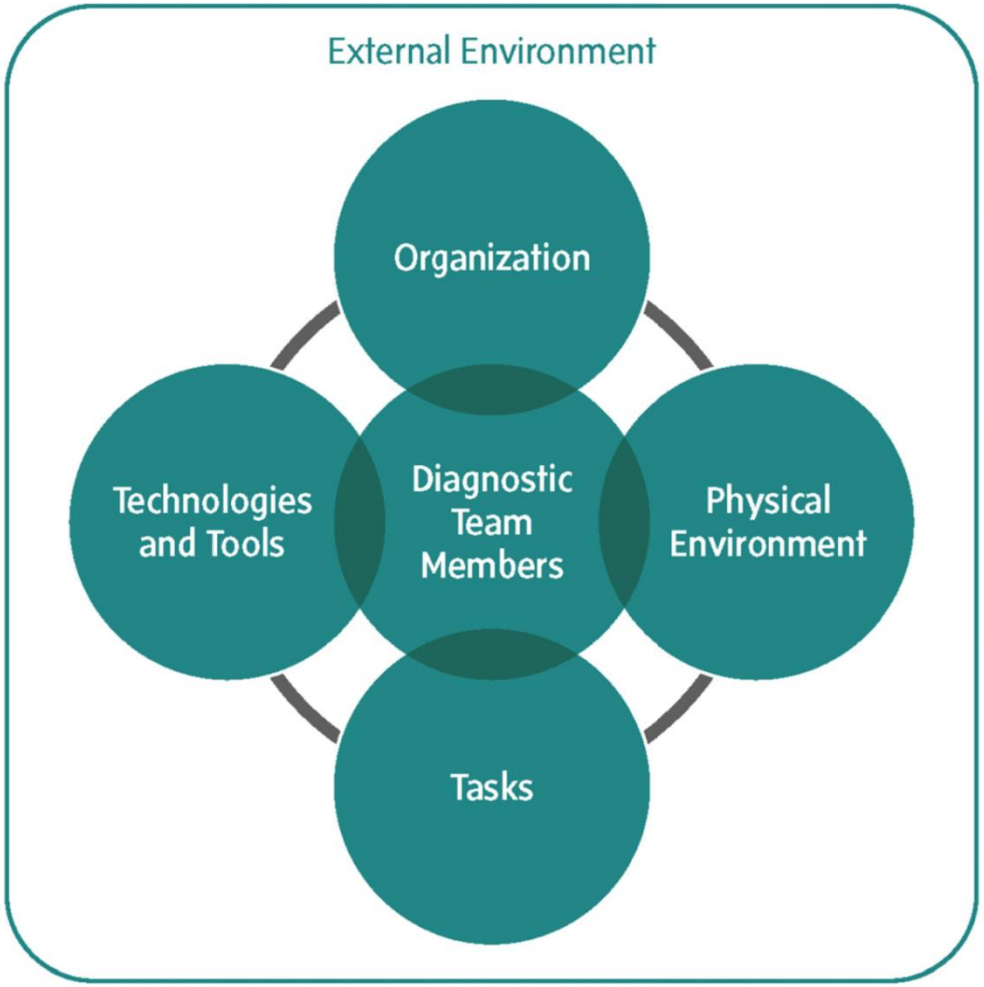
Anonymous aphorism

"I have been in so many doctors in the last few months, I need a physician to put it all together (...)"

One patient in the USA ED (Quoted by Barbara Starfield)

When it is system's fault…

The work system in which the diagnostic process takes place



National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*

Lack of clinic records or review…

- In the U.S. 1/7 admissions are due to lack of access to the Clinical Process of the patient and 20% of laboratory tests are ordered by lack of access to previous results

- 20-60% of laboratory tests are not reviewed by the physician, a percentage that may be 75% in case of Emergency

(Callen J, 2011)

The case of a man who became shorter…

When it is doctor's fault ...

Factors related to the characteristics of the physicians

- Age, physical condition, qualifications, experience, personality, workload, institutional context, remuneration model or incentives
- Knowledge and skills
- Behavioral features: opportunity, sense, intuition and communication skills

When it is doctor's fault ...

Factors related to the characteristics of the physicians

- The experience and number of cases improve outcomes in many procedures or pathologies (Posnett J 2002)
- A Heavy call (80-90 h / week) increases the risk of misdiagnosis 5.6 times (Landrigan CP, 2004)
- There is a relationship between communication skills and outcomes (Stavropoulou C, 2011)

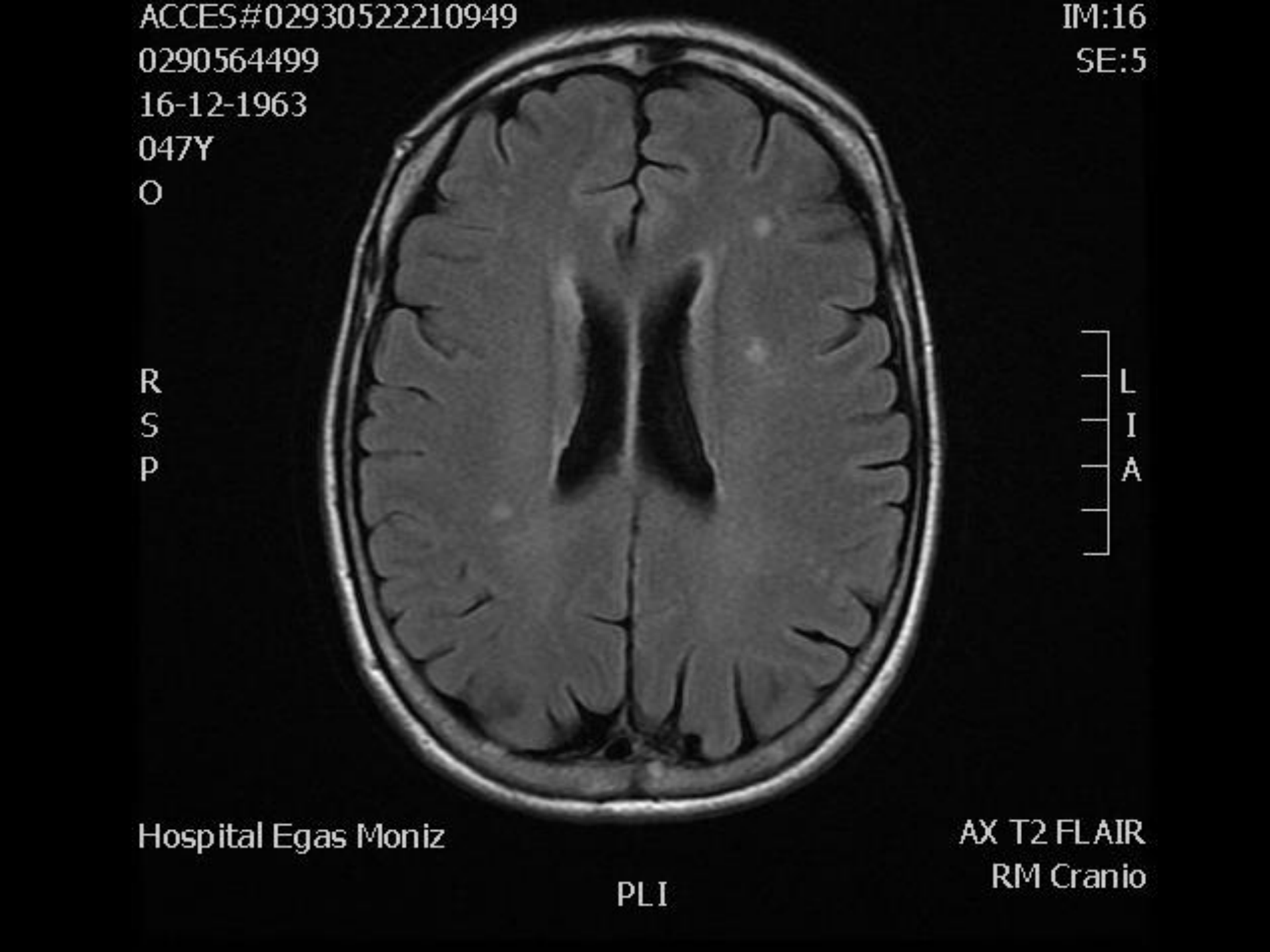
You WILL listen to me!!

A case of paranoia…

- 48 yo female with multiple admissions in psiquiatry for paranoid delusional ideation, personality disorders type cluster B and manifestations of facticious disorders.

- Last admission for attempt to defenestration, psycho motor agitation, catatonia, mental confusion and sphincters incontinence. Resistance to therapy, 9 sessions of electroconvulsive therapy.

- Agravation of chronic diarrhea, weight loss and peripheral edema.


ACCES#02930522210949
0290564499
16-12-1963
047Y
O
IM:16
SE:5
R
S
P
L
I
A
Hospital Egas Moniz
AX T2 FLAIR
RM Cranio
PLI

A case of celiac disease type 3…
(Marsh-Oberhuber classification)

Motivo de exame: Diarreia crónica
Anemia

Relatório de exame:

ESÓFAGO com morfologia mantida e mucosa sem alterações.
Cárdia sem lesões.

ESTÔMAGO com morfologia mantida. Boa distensibilidade das paredes com insuflação. Mucosa do fundo observada em inversão, sem alterações. Mucosa do corpo e antro sem alterações. Píloro centrado e permeável.

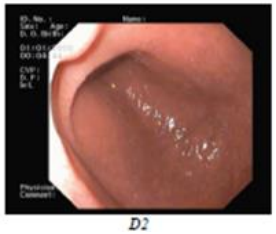
DUODENO: Bulbo com mucosa de aspecto granitado (F2- biopsias). D2 com mucosa fina e lisa, ligeiramente hiperemiada, com franco apagamento das vilosidades (F1).

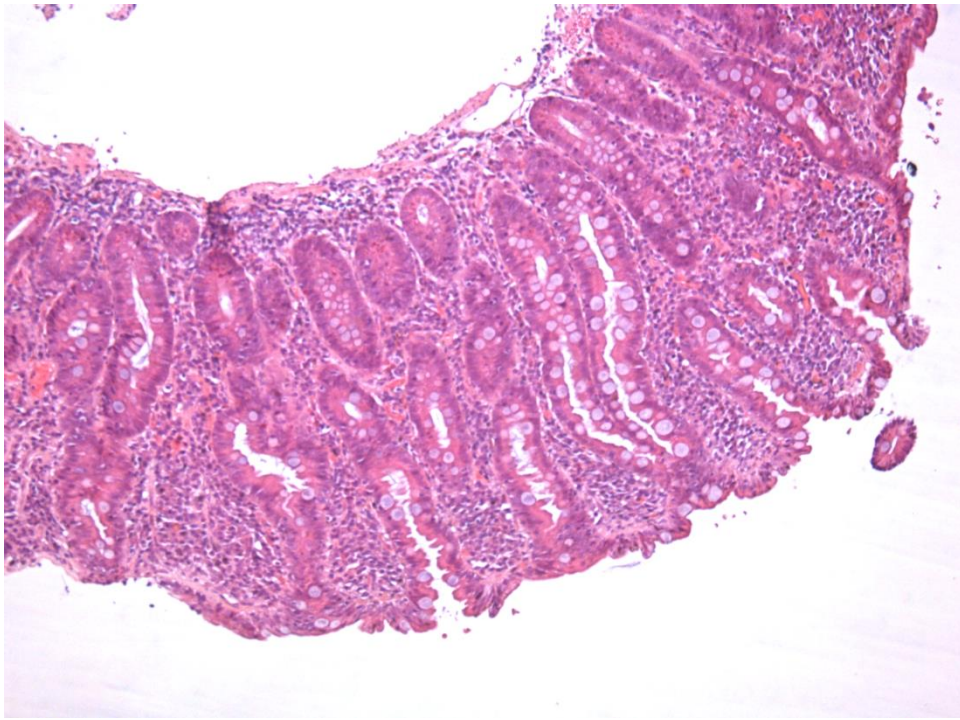
Procedimentos: - 1 Biópsias transendoscópicas

Impressões Diagnósticas:
bulbopatia a definir histologicamente
Mucosa duodenal (D2) atrófica (Doença celíaca?)


Bulbo


Bulbo- Pos biopsias

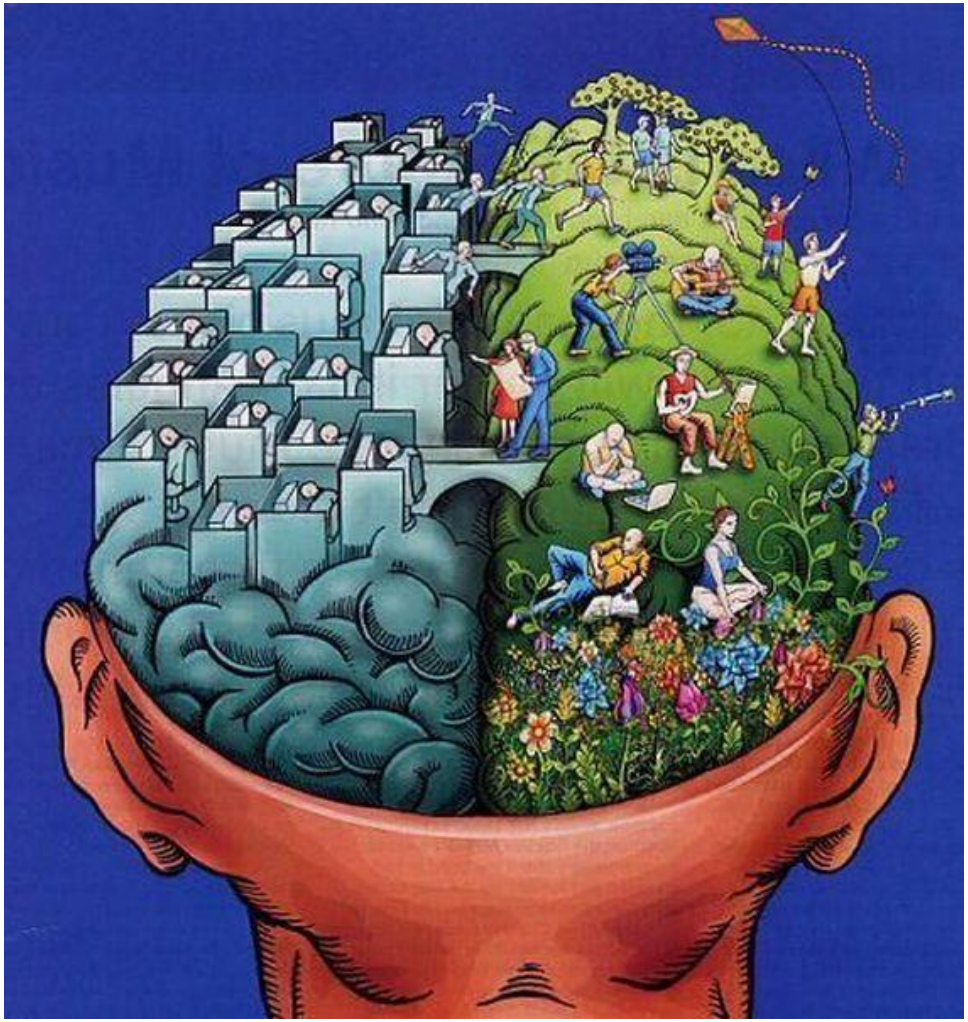

D2



Initiation of gluten free diet, progressive return to normality

Clinical decision making

Analytical decision making



Intuitive decision making

Heuristic factors in diagnostic hypothesis

- **Anchorage heuristic:** the physician sticks to the first impression

- **Premature closure:** a reluctance to seek alternative diagnoses, once a commitment has been established

- **Availability heuristic:** the physician makes the diagnosis by similarity to past cases

- **Framing effect**: the same clinical condition may lead to different decisions as the information is presented or framed

- **Blind obedience:** the doctor accepts the opinion of a respected colleague in the area, or the report of a supplementary examination, with undue deference

(Croskerry P. et al.*Acad Emerg Med* 2002; 9: 1184–204 2002)

4

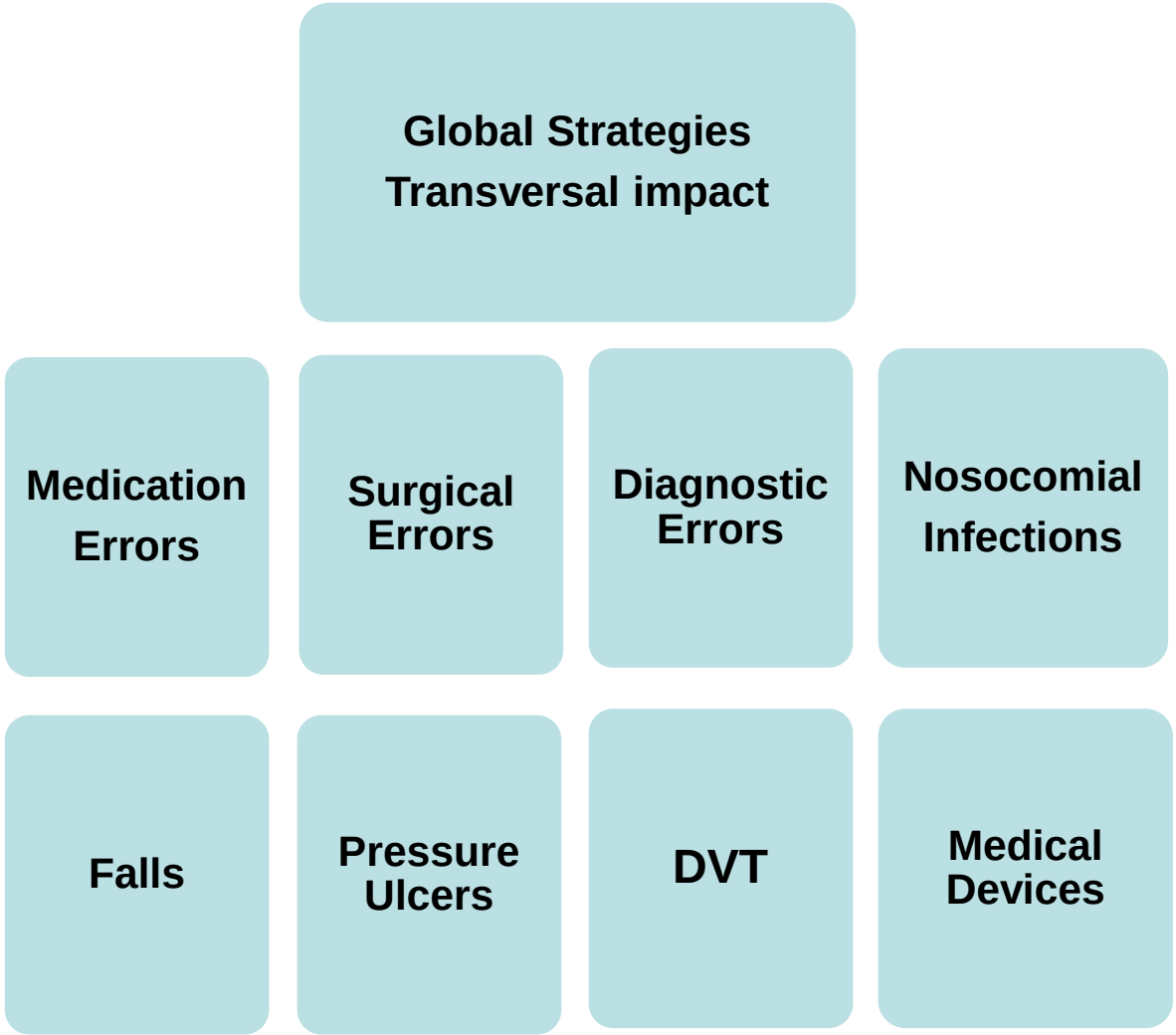
What can we do to prevent diagnostic errors?

Blame and shame game ➡ Systems Thinking

Systems thinking

Humans err, the safety depends on creating systems that anticipate errors and either prevent or catch them before they cause harm

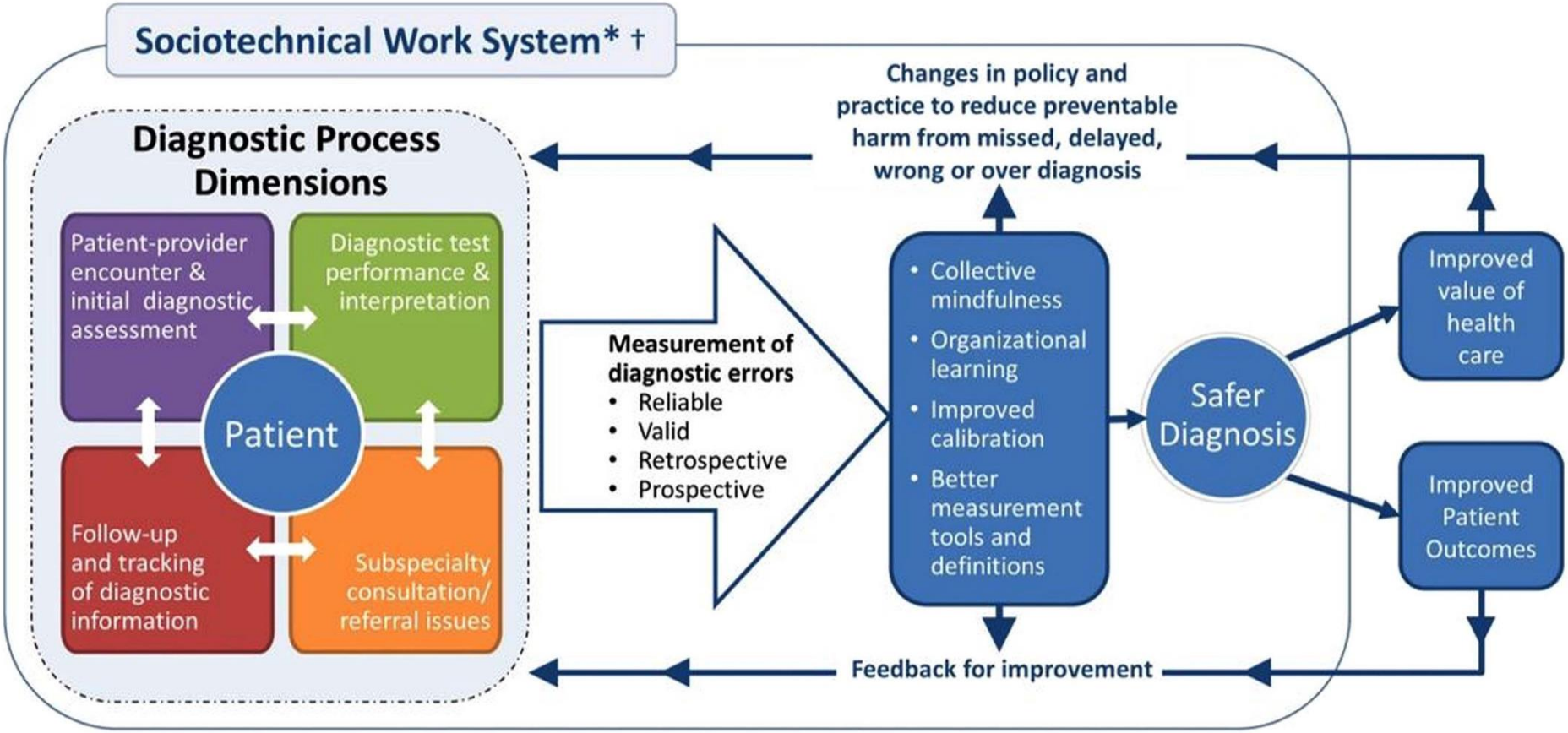
Strategies to prevent medical errors



General principles of patient safety improvement strategies

- Improve culture of safety
- Create incident reporting systems
- Standartization and simplification of processes
- Introduce forcing functions in the interface with machines
- Improving communication and teamwork
- Learn from one’s mistakes
- Well trained, staffed and rested wokforce

The Safer Dx framework for measurement and reduction of diagnostic errors



Singh H, et al. BMJ Qual Saf 2015;24:103-110. doi:10.1136/bmjqs-2014-003675

Goals for improving diagnosis and reducing diagnostic error (IOM 2015 recommendations)

- Facilitate more effective **teamwork** in the diagnostic process
- Enhance health care professional **education and training** in the diagnostic process
- Ensure that **health information technologies** support patients and health care professionals
- Develop and deploy **approaches to identify and reduce** diagnostic errors

National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*

Teamwork

Surgical blocks

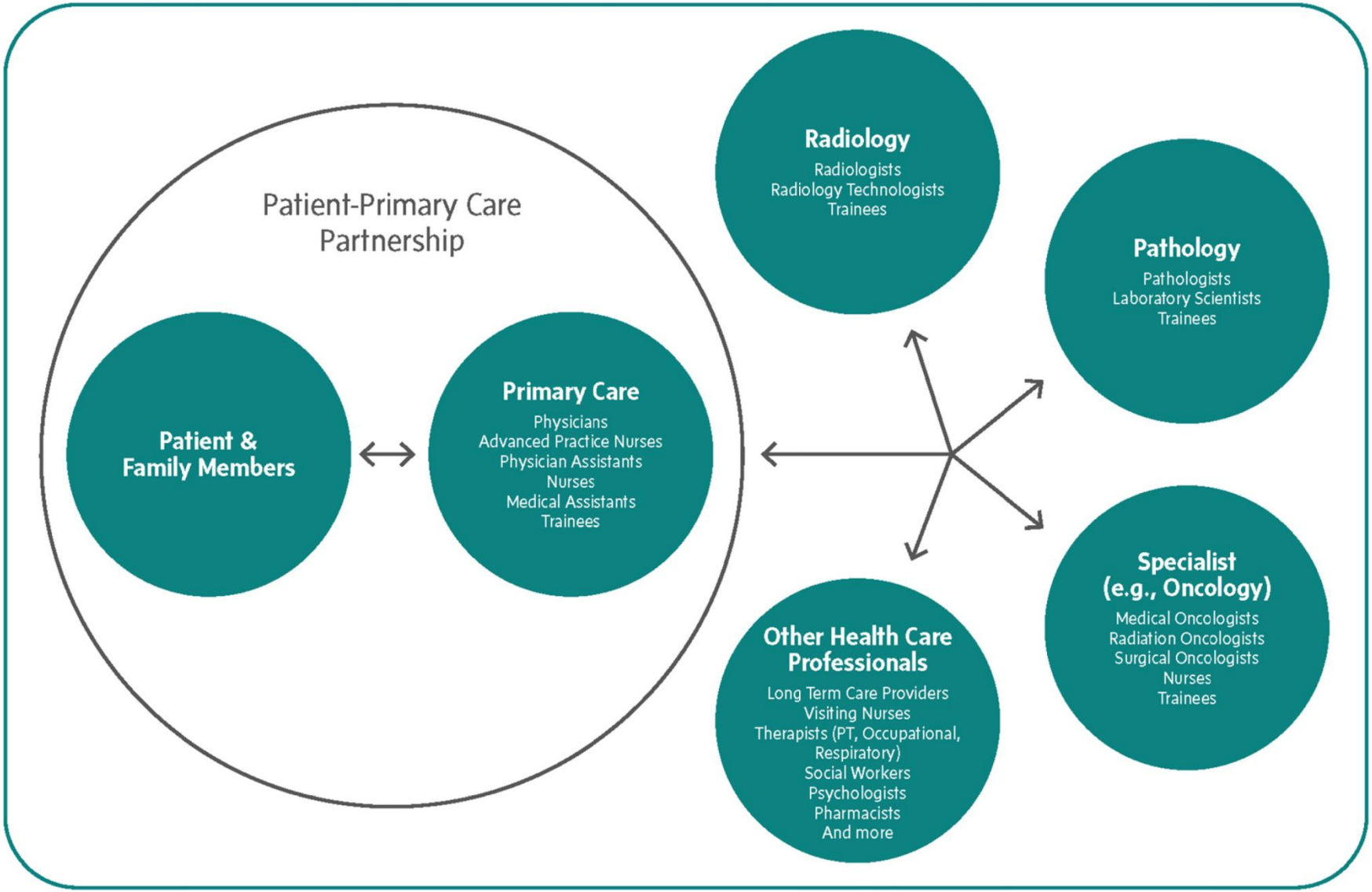
- Authority centered
- Poor distribution of tasks
- Poor supervision
- Rare check-listing
- Culture of infallibility
- Culture of blame

Cockpits

- Hierarchies <marked
- Better communication
- Perception of fatigue
- CRM (Team Training)
- Self-reporting without guilt
- Near Miss Reporting

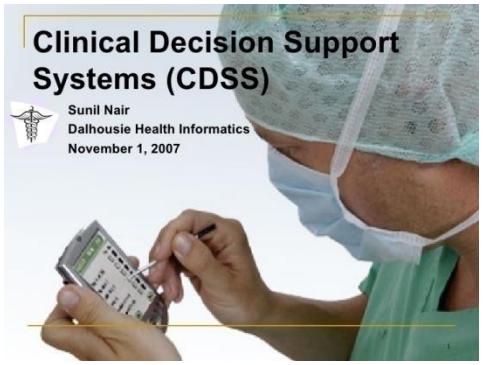
(Fragata J 2005, adaptação de Helmereich, 1990)

An example of diagnostic teamwork and the potential participants in the diagnosis process



National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*

Health Information Technology in the diagnostic process



Clinical case: the forgotten analysis…

- MSR, 81 yo. Female
- Erosive Rheumatoid Arthritis, with persistent high activity despite diverse DMARDS, and secondary Sjögren's syndrome, with a follow-up of 30 y.
- She started Infliximab in 2002, switched subsequently to Adalimumab, Rituximab and Tocilizumab.

.

Clinical case: the forgotten analysis…

- In 2012 she started losing weight, asthenia, episodes of productive cough with expectoration. Positive cultures of the bronchial secretions for H. influenza and P. aeruginosa in two episodes.

- Improvement with antibiotics but persistence of a consumptive state. Revision of the Electronic Clinical Record

Nome: [redacted] Processo: 26001127 Nascimento: 1932-01-04 (80 anos) NID: 388153

Serviço: Episódio: 12127187 CON Sexo: F

Microbiologia Geral

	Data Pedido Resultado	Unidade	Valor de referência	Data Pedido Res. anterior	Data Pedido Res. anterior
SECREÇÕES BRÔNQUICAS (por Fibroscopia)					
	3249025				
SECREÇÕES BRÔNQUICAS (por Fibroscopia) - EX. BACTERIOLÓGICO	2012-04-02 13:05 ME48491				
EX. DIRECTO					
Gram	Células epiteliais < 10/Campo Polimorfonucleares > 25/Campo Alguns bacilos Gram negativo Alguns cocos Gram positivo				
EX. CULTURAL					

Isolamento	*Pseudomonas aeruginosa*	*Staphylococcus aureus*
Ceftazidima	S	
Ciprofloxacina	S	
Gentamicina	S	S
Piperacilina/tazobactam	S	
Oxacilina		S

R - Resistente; I - Intermédio; S - Sensivel; NT - Não testado; SU - Susceptibilidade; IN - Resistência Intermédia; AG - Resistência Alto Grau

SECREÇÕES BRÔNQUICAS (por Fibroscopia) - EX. DIRECTO MICOBACTÉRIAS	2012-04-02 13:05 ME48491				
Coloração Ziehl-Neelsen	Não se observaram bacilos ácido-álcool resistentes				
SECREÇÕES BRÔNQUICAS (por Fibroscopia) - EX. CULTURAL MICOBACTÉRIAS	2012-04-02 13:05 ME48491				
EX. CULTURAL					
	Positivo para bacilos acido alcool resistentes				
	42.5	Dias			

Isolamento	*Mycobacterium intracellulare*

R - Resistente; I - Intermédio; S - Sensivel; NT - Não testado; SU - Susceptibilidade; IN - Resistência Intermédia; AG - Resistência Alto Grau

OBSERVAÇÕES:	Exame efectuado no Instituto de Higiene e Medicina Tropical

Imprimir Recua

MBoletim - Windows Internet Explorer provided by Centro Hospitalar Lisboa Ocidental

Ficheiro Editar Ver Favoritos Ferramentas Ajuda

http://clinidataappv.chlo.net/MBoletim.php

Favoritos

MBoletim

Página Segurança Ferramentas

Nome: [redacted] Processo: 26001127 Nascimento: 1932-01-04 (80 anos) NID: 388153

Serviço: Episódio: 12127187 CON Sexo: F

	Data Pedido Resultado	Unidade	Valor de referência	Data Pedido Res. anterior	Data Pedido Res. anterior
Microbiologia Geral					
SECREÇÕES BRÔNQUICAS (por Fibroscopia)					
	3249025				
SECREÇÕES BRÔNQUICAS (por Fibroscopia) - EX. BACTERIOLÓGICO	2012-04-02 13:05 ME48491				
EX. DIRECTO					
Gram	Células epiteliais < 10/Campo Polimorfonucleares > 25/Campo Alguns bacilos Gram negativo Alguns cocos Gram positivo				
EX. CULTURAL					
Isolamento	*Pseudomonas aeruginosa*	*Staphylococcus aureus*			
Ceftazidima	S				
Ciprofloxacina	S				

EX. CULTURAL

Positivo para bacilos acido alcool resistentes

42.5

Isolamento *Mycobacterium intracellulare*

R - Resistente; I - Intermédio; S - Sensivel; NT - Não testado; SU - Susceptibilidade; IN - Resist

OBSERVAÇÕES:

Exame efectuado no Instituto de Higiene e Medicina Tropical

Imprimir Recua

Incorrect reports or non detection of anomalies…

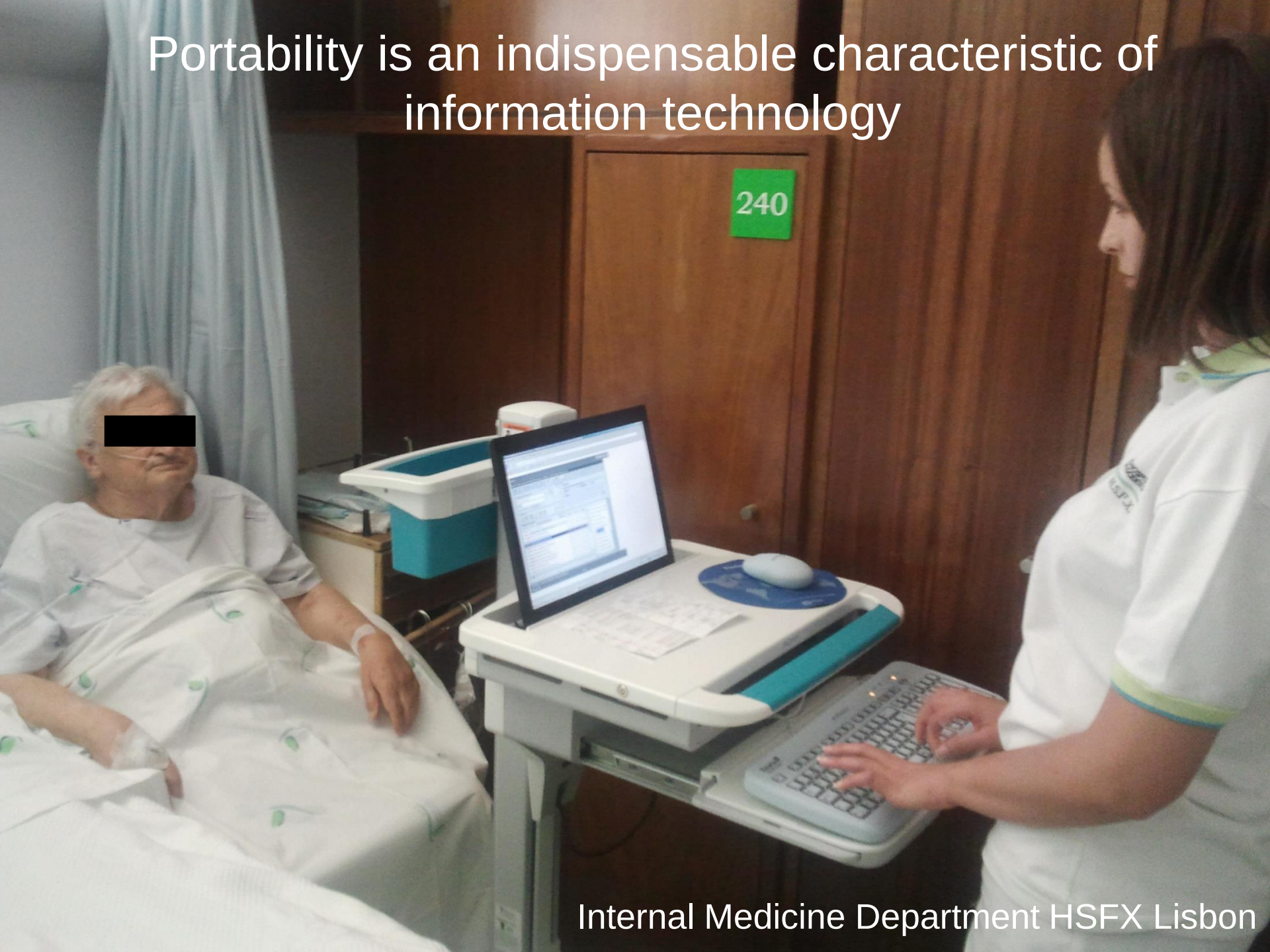
- The errors of laboratory tests may reach 20%, but only a quarter occurs within the laboratory (Stroobants AK, 2003).
- Of these errors, 18% are liable to cause any damage, either economic or related to the patient's health (Hickner J, 2008).
- There are errors on the order of 23% in the interpretation of chest radiographs (GR Tudor, 1997).
- The inter-observer variability in reading RMN can reach 23% (Wakeley CJ, 1995).

HIT approaches to assist diagnosis

1. Information gathering
2. Information organisation and display
3. Differential diagnosis generation
4. Weighing of diagnosis
5. Generation of diagnostic plan
6. Access to reference information
7. Facilitating follow-up
8. Screening for early detection
9. Collaborative diagnosis
10. Diagnostic feedback to clinicians

El-Kareh R, Hasan O, Schiff GD. BMJ Qual Saf 2013;22:ii40–ii51.

Portability is an indispensable characteristic of information technology



Internal Medicine Department HSFX Lisbon

Goals for improving diagnosis and reducing diagnostic error (IOM 2015 recommendations)

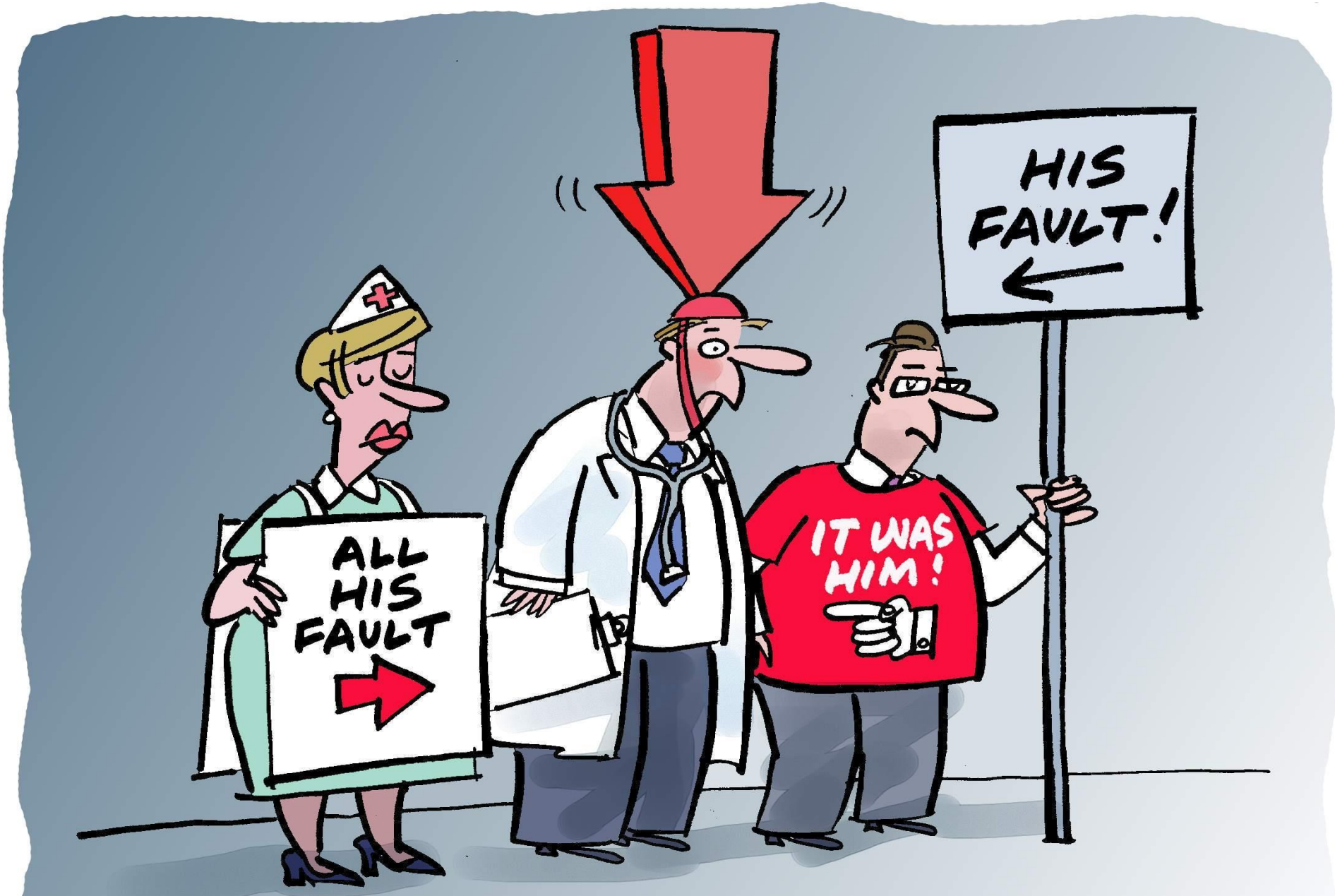
- Establish a **work system and culture** that supports improvements in diagnostic performance

- Develop a **reporting environment and medical liability system** that facilitates improved diagnosis through learning from diagnostic errors and near misses

- Design a **payment and care delivery environment** that supports the diagnostic process

- Provide **dedicated funding for research** on the diagnostic process and diagnostic errors

National Academies of Sciences, Engineering, and Medicine. 2015. *Improving diagnosis in health care. Washington, DC: The National Academies Press*



"DR. SIMPKINS DREW THE SHORT STRAW AT THE PRE-INSPECTION MEETING"

Analysis of a diagnostic error

09/04/2011
05h22m
Sala Operatória
Diário de Enfermagem

09/04/2011
05h45m
Sala Operatória
Diário de Enfermagem

09/04/2011
05h55m
Sala Operatória
Folha de Anestesia

Extracção de feto morto com malformação

Doente hemodinamicamente instável

Tentativa de colocação de CVC jugular

Paragem cárdio-respiratória

AESP

Iniciado SAV

Cardiologista, M. Interna, Anestesia, Obstetrícia

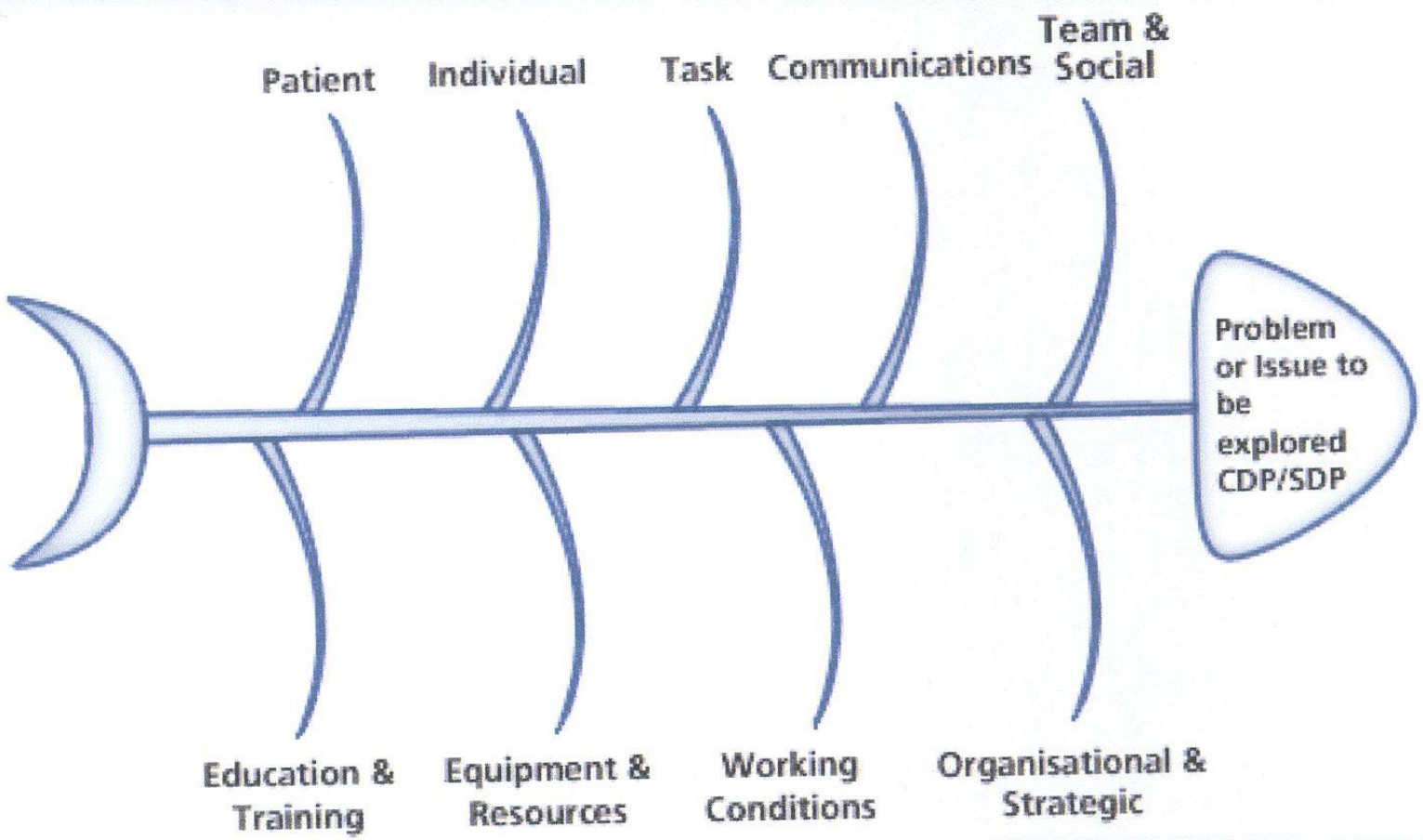
Óbito às 6h33min

Rx Tórax disponível em película às 05h30: ARDS

EcoTT (05h50): VE e cavidades direitas não dilatadas. Sem derrame pericárdico. PSAP 38. VCI 20mm

Inicial recuperação de pulso às 6h02
Nova PCR em AESP às 6h12

Ishikawa's Diagram



Report.npsa.nhs.uk/rzcatookit/course

CLINICAL CASE

47 y. old, male.

ER — Lymphadenopathy, hoarseness and respiratory distress — Companion stood at the door

↓

ORL Emergency — 5 Floor — Hyperaemia of the pharynx – Salivary stasis prevents observation of endolarynx

Corticoid IM + Antibiotic + NSAID → (discharged)

↓

1st Floor → asphyxia → CPR — Absence of Resuscitation team

↓

ER → Call of Anesthesiology for intubation — 5 Floor

↓

LIFE SUPPORT → VEGETATIVE STATE → DEATH

My ten recomendations to young internists to prevent the diagnostic errors…

1. Listen and examine the patients carefully!
2. It is no shame to have doubts but always clarify the doubts!
3. Don’t rely on first impressions and be aware of dissonant information!
4. Think first of common diseases but don’t stop if subsists a more severe hypothesis!
5. Don’t make corridor consultations and never facilitate!

My ten recomendations to young internists to prevent the diagnostic errors…

6. Do the right tests to the right patient at the right time, but be aware of the sensitivities and specificities!
7. Recognize when you are tired and your limitations!
8. Register always
9. Report and learn with your mistakes
10. Again listen and examine the patients carefully


I'm
Sorry.
© Maroon Surreal