SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Ferrara

International Network of Health Promoting Hospitals & Health Services

Università degli Studi di Ferrara

The case history of the innovative sanitation system PCHS®: the contribution to the research of Ferrara University Hospital

Paola M. Antonioli

Chief Medical Officer of Hospital Hygiene & Healthcare Associated Infection Risk Management Department - Ferrara University Hospital

p.antonioli@ospfe.it, igiene.ospedaliera@ospfe.it

TRAINING SEMINAR

The event is realized thanks to the unconditional support of copma produttori di igiene

ACTIVE CITIZENSHIP NETWORK
CITTADINANZATTIVA

AGENDA

- Ferrara University Hospital: some informations
- The contribution to the research of Ferrara University Hospital
- NSG Project: a multimodal and multidimensional intervention strategy to reduce HAIs
- Some Results
- New tool pipelines in 2012-2019

Ferrara University Hospital: CONTEXT AND ACTIVITIES	2011	2012 (New Hospital Opening from 8th may 2012)	2017 New Hospital
Reference population	359.686	359.686	346.975
Workforce (+ Resident Physicians and Workers of external Partners)	2.571 ~ 4.000	2.630 ~ 4.000	2.586 ~ 4.000
Beds	860	770 (attivi 670)	770 (attivi 708)
Healthcare buildings	~109.000 mq (2 HospItals)	~250.000 mq (2 Hospitals + 1 Clinic)	~160.000 mq (1 Hospital)
Hospital admissions	37.685	33.023	33.262
% Surgery admissions	45,1%	41,3%	47,9%
% high-complexity DRG	n.r	n.r	20,5%
Hospitalization days	222.158	186.973	220.874
Outpatient health services	4.144.328	4.615.889	2.780.861
Operating Theatres (including 1 Delivery Room)	21 (7 BB.OO. + 1 PNBO)	23 (2 BB.OO. + 1 PNBO)	23 (2 BB.OO. + 1 PNBO)
Access to emergency (I° semestre 2013)	79.811	75.127	85.246

Ferrara University Hospital: Healthcare Facilities before 2012

► **"Old Arcispedale S.Anna Hospital", FERRARA**

Emergency activities, All inpatient functions, All high technologies, Outpatient functions and pathways connected, Related teaching and research activitie

► **Rehabilation Hospital "Nuovo S.Giorgio", FERRARA**

Rehabilitations pathways (hopsuital stay, DH, outpatient rehabilitation and related teaching and research activities)

Ferrara University Hospital: Healthcare Facilities from 2012 to 2016

►**Outpatient Clinic "Old Arcispedale S.Anna", FERRARA**

Outpatient specialist activities not related to new Hospital, guaranteeing complete clinical pathways

► **Rehabilation Hospital "Nuovo S.Giorgio", FERRARA**

►**"New Arcispedale S. Anna", Cona di FERRARA**

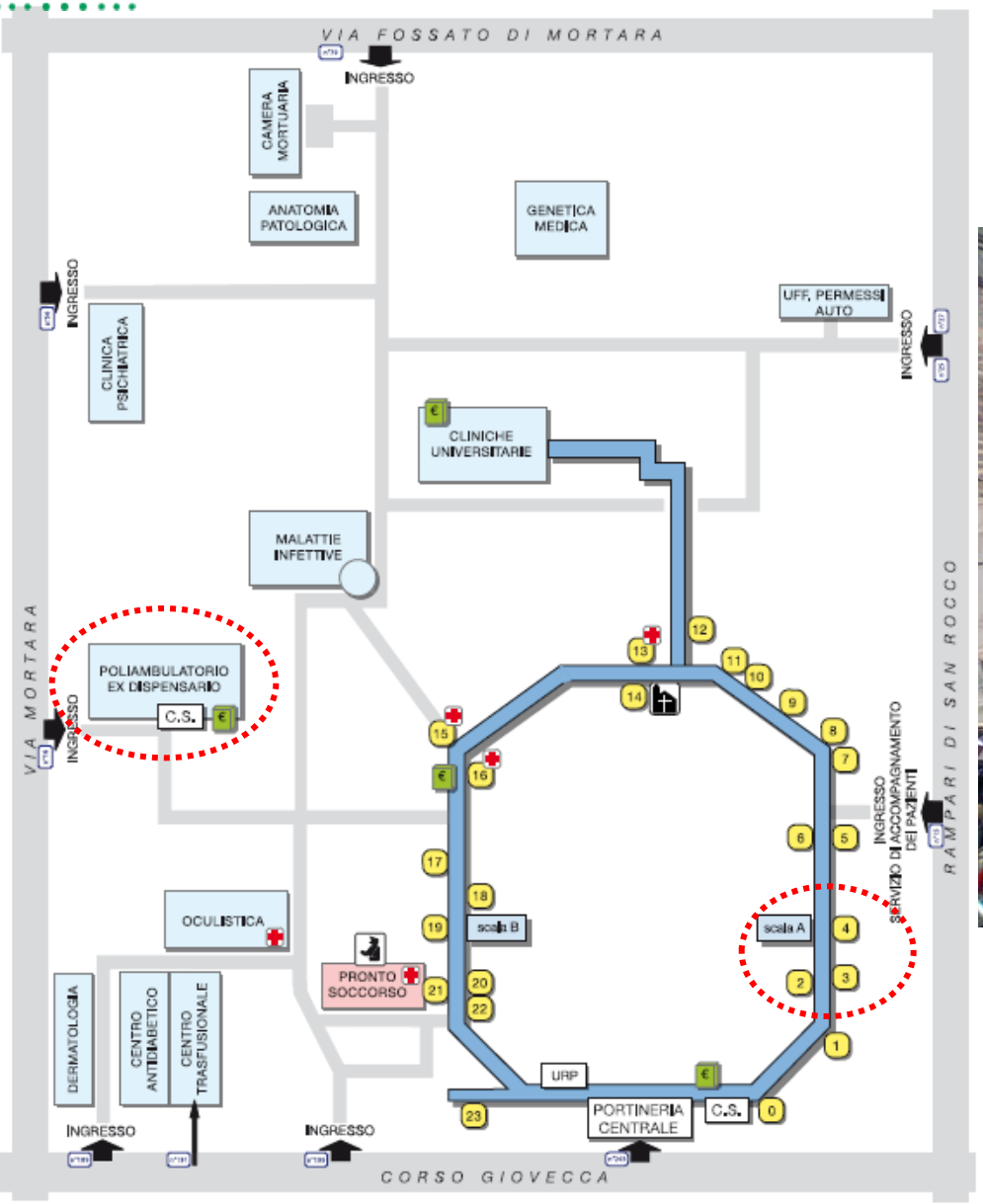
Emergency activities, All inpatient functions, All high technologies, Outpatient functions and pathways connected, Related teaching and research activitie

Ferrara University Hospital: Healthcare Facilities from 2017

►**"New Arcispedale S. Anna" + Rehabilation Hospital "Nuovo S.Giorgio"**

Cona di FERRARA

Old “Arcispedale S.Anna Hospital”, FERRARA



The Case history: CHAPTER 1 (2009)

PURPOSE OF FIRST RESEARCH → **To verifie the quantitative, efficacy and efficiency of probiotic products compared to the use of traditional treatments based on chemical disinfectants**

CARRYING OUT → ***in vitro*** (to verifie the reduction of pathogen on samples of surfaces treated with probiotics)

TESTED PATHOGENS →
- ***Stafilococcus Aureus***
- ***Pseudomonas Aeruginosa***
- ***Escherichia Coli***

on sample surfaces, **representative of the finishes of the S.Anna Hospital**

The Case history: CHAPTER 2 (autumn 2010)

PURPOSE OF FIRST RESEARCH → **To verifie the quantitative, efficacy and efficiency of probiotic products compared to the use of traditional treatments based on chemical disinfectants**

CARRYING OUT → ***on the field - real operating conditions*** (to verifie the reduction of pathogen load in 2 medical inpatient wards and in the Polyclinic of the **"S.Anna Hospital" in Ferrara**)

Presence of **recontamination phenomena** of the sanitized environment, linked to the logistic of the wards (recontamination by plant systems, resuspension of deposited powders due to convective phenomena, contribution by staff, patients, visitors and material handling).

The experiments “on the field" were carried out by submitting two different types of hospital areas (inpatients wards and Policlynic) to cleaning procedures using both chemicals and probiotic products and measuring the pathogenic charge.

TESTED PATHOGENS beyond the TVC

- **Stafilococcus Aureus**
- **Pseudomonas aeruginosa**
- **Escherichia coli**
- **Candida albicans**
- **Acinetobacter**
- **Clostridium difficile**

Total microbiological sampling: approximately **14,400** (in triple) carried out under real operating conditions, on different types of surfaces, horizontal and vertical, and in the presence of continuous recontamination phenomena

Research conducted by the CIAS Research Center of Ferrara University of and the Ferrara University Hospital

RISULTATI

1. **The overall average percentage reduction rate of pathogens in the case of <u>use of the Probiotic</u> protocol, compared to the case of use of traditional disinfectants, was more than 70-80% AFTER 3 MONTHS OF APPLICATION.**
2. **In the case of use of <u>traditional disinfectants</u>, the microbial load increases from the first minutes after sanitization, doubling or tripling within just 7 hours of distance.**
3. **As regards <u>Probiotic products</u>, the increase in bacterial load over time has been significantly lower.**

The N.S.G. PROJECT: Purpose

Create a **safer environment** for patients, workers, caregivers, visitors by **reducing Healthcare Associated Infections (HAIs)** shares through proven and sustainable actions implemented with a **MULTIMODAL AND MULTIDIMENSIONAL STRATEGY**.

1. **Reduce the HAI by 20%**
2. **To evaluate if it is possible reduce HAI by modifying the environmental microbiota**
3. **To evaluate if it is possible reduce colonization and infections caused by antibiotic-resistant microorganisms (Alert microorganisms) modifying the environmental microbiota**

Rehabilitation Hospital “Nuovo S.Giorgio”: Why?

Clinical context:

- Neither acute or long-term care Helathcare Facility (Intensive post-acute Rehabilitation)
- Kind of patients: myelo-lesions, severe brain injury (complexity)
- Admission of patients often in continuity with acute care, especially I.C.U.
- Patients coming from provincial, regional and extra-regional areas
- Length of stay also very long: weeks / months
- High prevalence of patients colonized / infected with bacteria resistant / multi-resistant to antibiotics (alert organism)

  ➡ Eg. 61% Klebsiella pn. I/R (anno 2011)
- Previous prevalence studies which indicated the need to perform a deepening on HAIs in this care setting not much studied

Organizational context:

- Hospital not involved in the transfer to the "New Arcispedale S.Anna - Cona"

Materials and methods

→<u>Research structure</u>: to conduct experimental field research for a significantly long period (14 months), continuously, monitoring the environmental microbiological status and measure the incidence of HAI

→Survey form (definitions and criteria from PPS ECDC 2011:

► 2 Sections:

- At admission in NSG (44 variables)
- At diagnosis of HAI (33 variables)

→<u>Basic operational needs</u>: an integrated environmental sanitation system (PCHS - Probiotic Hygiene Cleaning System), consisting of an organized set of procedures, materials, techniques

Rehabilitation Project - Care Areas:

- Inpatient areas
- rehabilitation gyms
- areas of speech therapy
- areas of cognitive-behavioral rehabilitation
- dining room, rooms for socializing, school, etc..
- Outpatient areas and gyms

Multimodal strategy: key elements

An evidence-based approach based on 5 basic components (WHO strategy): culture and practice of safety.

Organizational actions (system changes)

-> Eg. - Hydro-alcoholic Product at the point of care

- > Eg. PCHS – Probiotic Hygiene Cleaning System

+

Training of health workers and cleaners
Promotion of good practices between patients - caregivers - visitors

+

Observation of care practices & Feedback

+

"*Reminders*" in the workplace (Posters)

+

Climate targeted to patient safety and quality of care

MULTIDIMENSIONAL STRATEGY (Policy AOUFE):

Multimodal strategy

3 MACRO-AREAS OF INTERVENTIONS:

1. HAND HYGIENE

2. HEALTH CARE ENVIRONMENT

3. GOOD PRACTICES

Systematic implementation of PCHS Protocol (December 2011)

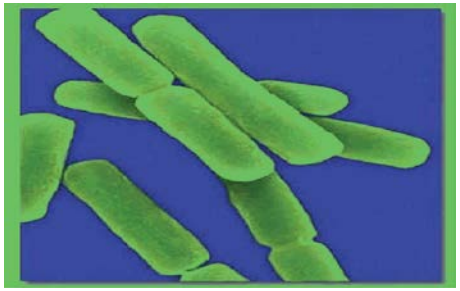
RESULTS: PROCESS INDICATORS

(1) Reduction in hospital environment of potential pathogens

applying **PCHS.**

Compression and stabilization of nosocomial potentially pathogenic microorganisms on target surfaces sampled (floor, sink, handrails, patient unit).

Compression of the Total Microbial Load **lower 80%**
detected on **over 30.000 samples**
of environmental surfaces.



(2) Hand Hygiene Compliance: results of observations

N.S.G	2011 (T0) (Novembre-Dicembre)	2012 (T1) (Aprile-Agosto)	2012 (T2) (Settembre-Dicembre)
Compliance	32% Range: 29-36	61% Range: 58-63	62% Range: 59-65

CRITICAL COMPLIANCE (not safe)

< 40%

→

Italian Compliance 2008

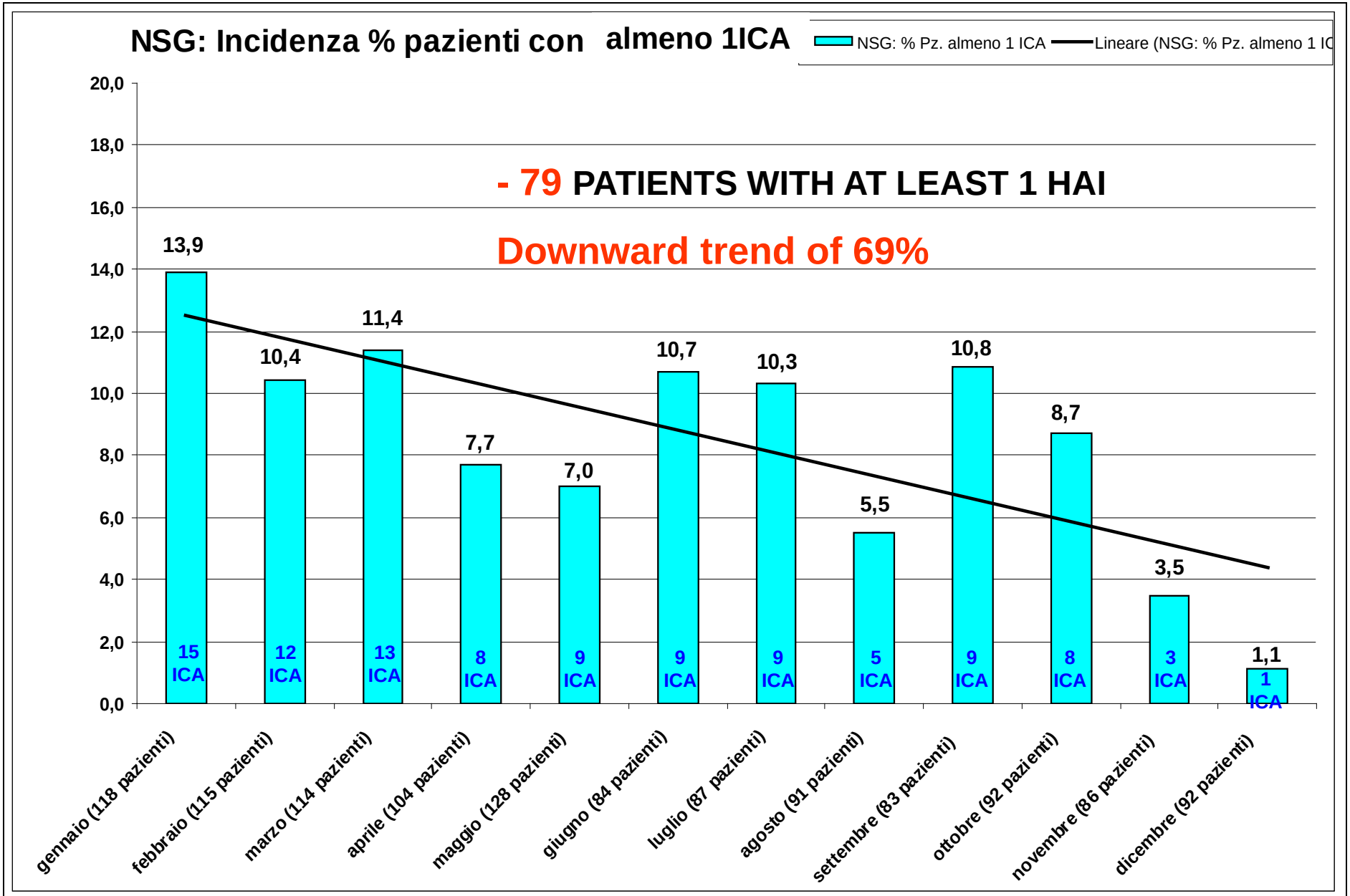
65%

→

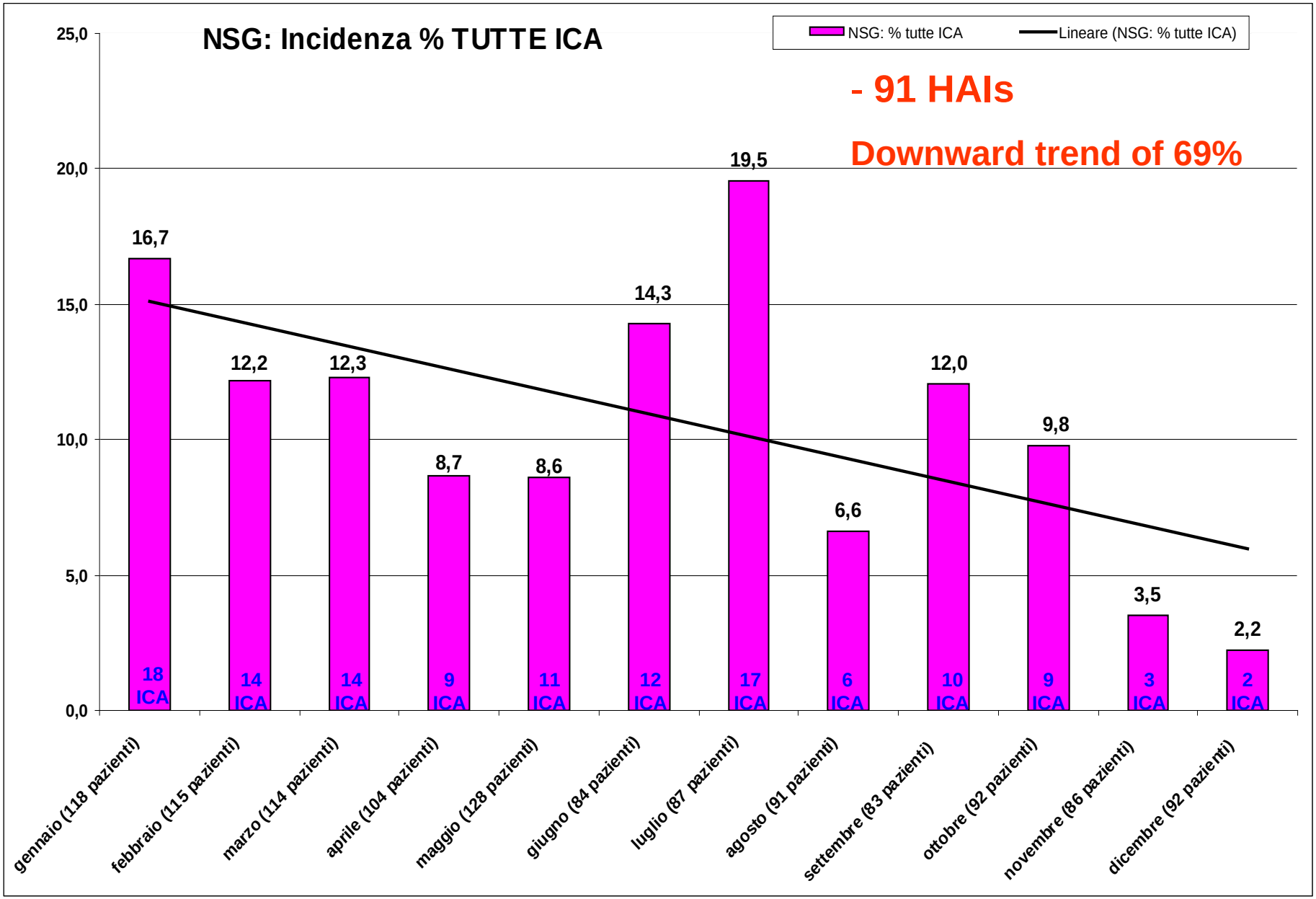
WHO TARGET 2011

75%

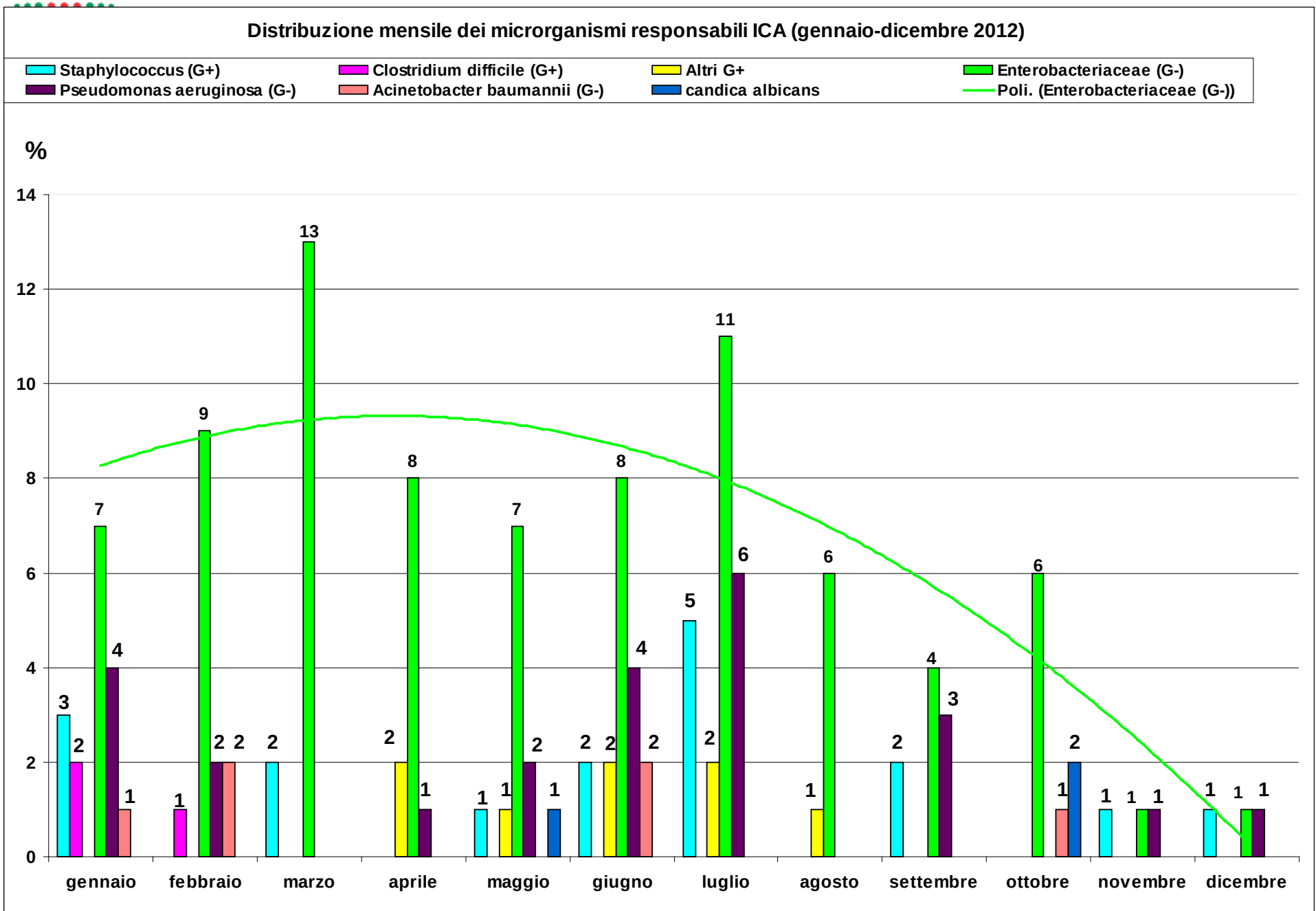
3) Incidence rate (%) of HAIs per month (January-December 2012)



Incidence Rate (%) of HAIs per month (January-December 2012)

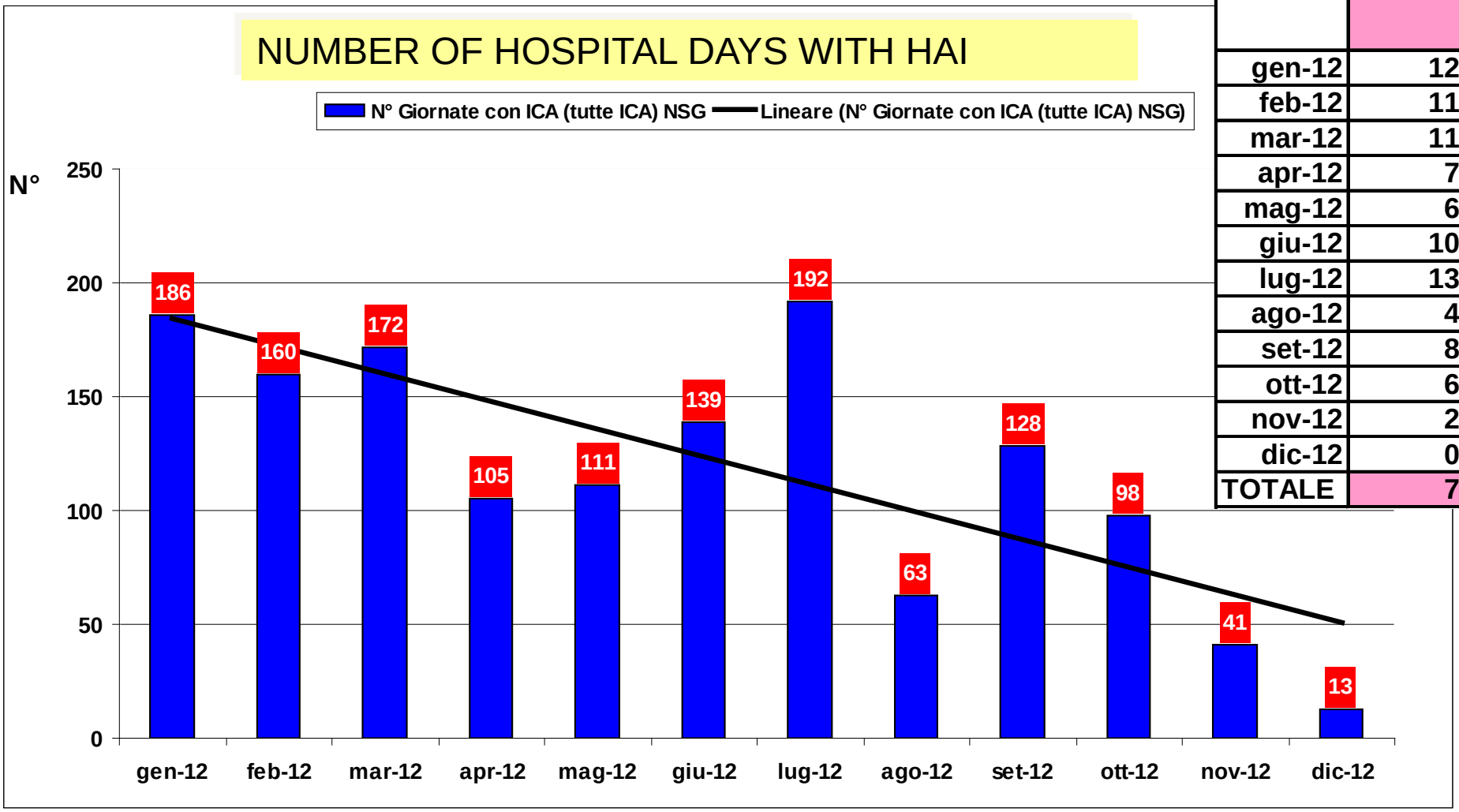


Monthly distribution (%) of microorganisms responsible of HAIs



THE SOCIO-ECONOMIC LOAD OF HAIs

"The cost associated with a hospital-acquired infection in terms of morbidity and mortality and, even more important in terms of human suffering, it is not calculable."



Mese	% Giornate di degenza consumate con ICA (tutte ICA) su tutte le ggdd
gen-12	12,7
feb-12	11,0
mar-12	11,1
apr-12	7,7
mag-12	6,5
giu-12	10,0
lug-12	13,4
ago-12	4,1
set-12	8,8
ott-12	6,1
nov-12	2,8
dic-12	0,9
TOTALE	7,8

AVERAGE COST of HAIs BY SYTE & TOTAL IMPACT

GENNAIO-DICEMBRE 2012: durata (giornate di degenza consumate) ICA e costi, totali e per localizzazione delle ICA	Tutte ICA NSG	N° Giornate con ICA (tutte ICA) NSG	DURATA MEDIA (giorni) NSG	RANGE (giorni) NSG	COSTO TOTALE giornate di degenza con ICA (standard+ATB-T; esclusi costi isolamento) NSG	COSTO MEDIO giornata di degenza con ICA (standard+ATB-T; esclusi costi isolamento) NSG	COSTO MEDIO ICA (standard+ATB-T; esclusi costi isolamento) NSG
N° ICA totali	125	1.408	11,3	6-34	638.009	453	5.104
Tratto urinario	73	951	13,0	6-29		range: 441-540	5.816
Polmonite	2	30	15,0	11-19		polomonite-sistemica	6.613
Basso tratto respiratorio	23	421	18,3	7-34			8.143
Sangue (batteriemie)	18	293	16,3	7-34			7.509
Cute e tessuti molli	2	30	15,0	12-18			6.933
Tratto gastro-intestinale	3	59	19,7	9-22			8.794
Intraddominale	3	33	11,0	6-18			4.907
Sistemica	1	20	20,0	20			10.804

Socio-economic load of HAIs:

→ **7,8%** inpatient days was consumed with an HAIs on all ii.dd.

→ **5,1%** was the increase costs by HAIs on the cost of inpatient days

→ HAIs average cost (excluding isolation costs): **€ 5.104,00**

→ Savings in 2012 amounted to € 464.464,00 (- 91 HAIs)

NEW TOOL PIPELINES from 2013

2013: PCHS implementation in all AOUFE

Safety for patiets

HAND HYGIENE (Observation and measure of alcool products cosupmtion

HAIs surveillance (Incidence & Prevalence, screening) and Interventions

Riduction of environmental impact of "Green Cleaning"

Scientific Board to designe the multicentre, prospective intervention Study "SAN-ICA"

Safety of probiotics used for hospital environmental sanitation

Biological samples taken from patients

Analyses performed in the years 2011 - 2018 in the Hospitals continuously using the Bacillus-based Probiotic Cleaning Hygiene System (PCHS)

FERRARA UNIVERSITY HOSPITAL	2011	2012	2013	2014	2015	2016	2017	2018	Total
HOSPITAL ADMISSIONS	29.457	25.917	26.376	27.379	27.135	26.863	24.956	25.738	188.083
	2011	2012	2013	2014	2015	2016	2017	2018	Total
OLD S.ANNA HOSPITAL	429	-	-	-	-	-	-	-	429
S.GIORGIO HOSPITAL	103	704	701	613	765	722	-	-	3.608
NEW S.ANNA HOSPITAL	-	-	6.346	7.290	7.593	7.926	8.931	9.626	47.712
DELTA HOSPITAL	-	76	1.025	969	1.154	1.321	746	1.420	6.711
CENTO HOSPITAL	-	72	631	713	750	819	776	298	4.059
ARGENTA HOPSITAL	-	240	403	498	554	649	523	602	3.469
QUISISANA HOSPITAL	-	-	-	-	510	521	542	568	2.141
Total	532	1.092	9.106	10.083	11.326	11.958	11.518	12.514	55.615

NO INFECTIONS DUE TO THE BACILLUS USED IN PCHS

Genuary, 2013: the new Hospital strategy for environmental hygiene

	STRENGTHS (with evidence)	WEAKNESSES (with evidence)
PCHS™ Probiotic Cleaning Hygien System **PCHS PROTOCOL FOR MANUAL CLEANING**	- Based on **probiotics** - Specific **training** of cleaners - **Effective** environmental hygiene - **Exposure reduction** to chemicals of patients, caregiver and staff - **Environmental protection** **It's our basic cleaning method.**	**Not usable in all care units** (areas where we want low microbial load: eg. operating theatres, interventive rooms, "clean rooms" like Antiblastic or Radiopharmaceutical Units).
MANUAL CLEANING WITH CHEMICALS **+** **DECONT. WiTH AUTOMATIC EQUIPMENT (GLOSAIR™)**	- **Sodium hypochlorite** - Generates a **dry mist of fine hydrogen-peroxide + silver cations**, non-toxic, non-corrosive and more than 99% biodegradable, maximizing the contact on all surfaces, with no residues & odor - **Final disinfection** - **Periodic treatment**	- **Not usable in presence of patients / operators** - Need **time** for the decontamination to occure

Increase of epidemiological trend:[3]

WHY?

- ✓ increase in immunocompromised patients or, in any case, FRAGILE
- ✓ increase COMPLEX assistance
- ✓ increase procedures and INVASIVE devices

Increase of the most serious sites :[3]

WHY?

- INCREASE in patients' basic GRAVITY
- diffusion of RESISTANT-MULTIRESISTENT microorganisms to antibiotics
- new and "old" INFECTIOUS EMERGENCIES

[3] http://asr.regione.emiliaromagna.it/wcm/asr/aree_di_programma/rischioinfettivo/gr_ist/pr_inf_ccm.htm
Harbarth S, Sax H, Gastmeier P. The preventable proportion of nosocomial infections: an overview of published reports. J Hosp Infect 2003; 54: 258–266

Not all HAIs are preventable ... .. BUT

Approximately 20-30% are considered preventable through STRUCTURED HYGIENE AND CONTROL PROGRAMS.

In particular, are more preventable HAIs related to the use of INVASIVE MEDICAL PROCEDURES AND DEVICES:

- →Central Line-Associated Bloodstream Infection (BSI)
- →Urinary Tract Infections Catheter-related
- →VAP (Ventilator (Intubation) -Associated Pneumonia)
- →SSI (Surgical Site Infections)

(1) Harbarth S, Sax H, Gastmeier P. The preventable proportion of nosocomial infections: an overview of published reports. J Hosp Infect 2003; 54: 258–266
(2) Umscheid CA, Mitchell MD, Doshi JA, Agarwal R, Williams K, Brennan PJ. Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. Infect control Hosp Epidemiol. 2011 Feb;32(2):101-14.

MULTIDIMENSIONAL STRATEGY (Policy AOUFE):

Multimodal strategy

3 MACRO-AREAS OF INTERVENTIONS:

1. HAND HYGIENE

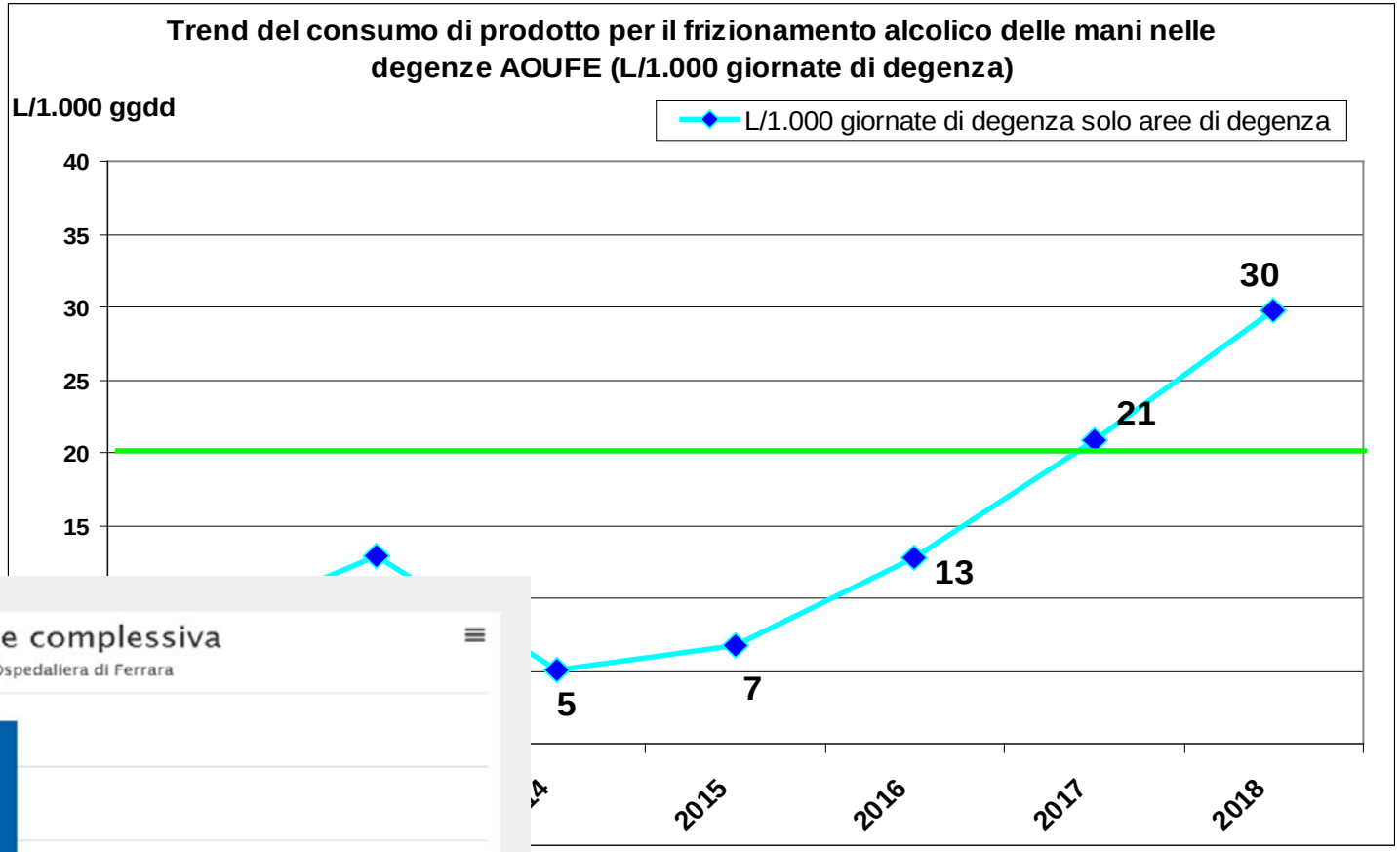
2. HEALTH CARE ENVIRONMENT

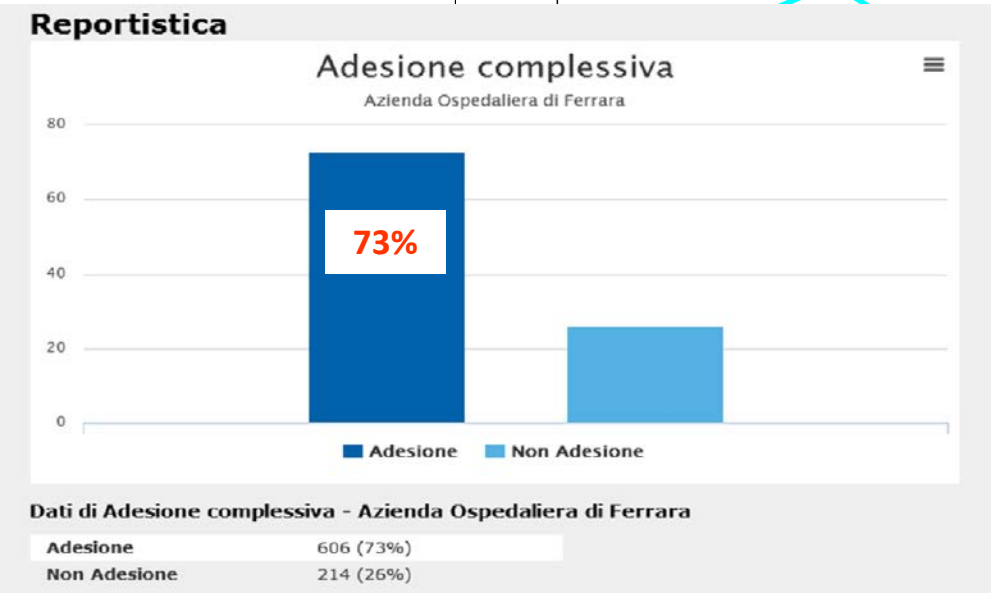
3. GOOD PRACTICES

Systematic implementation of PCHS Protocol (2012)

Consumption trend of alcohol-based product for hand hygiene (proxy indicator) and Compliance

WHO TARGET
TARGET 20
L/1.000 ggdd



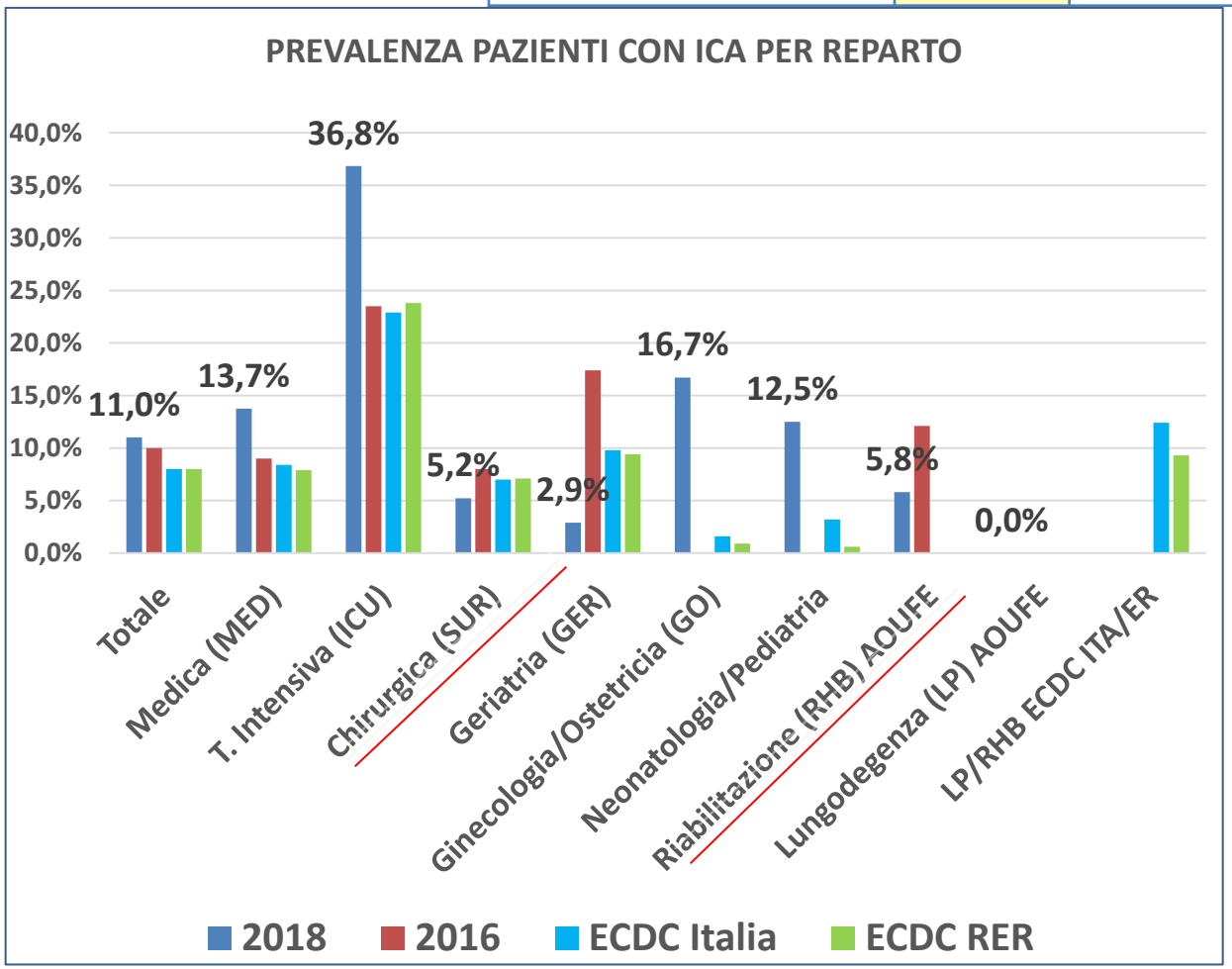


Hand Hygiene Compliance

WHO TARGET 75%

Ferrara University Hospital: POINT PREVALENCE SURVEY OF HAIs

	2018 AOUFE	2016 AOUFE	2016 PPS2 ITA	2016 ECDC ER
PREVALENCE RATE	**11,0%**	10,0%	8,03%	8,0%



Dealing with HAIs in AOUFE:

- Hand hygiene

- Prudent antibiotic prescription

  - Antimicrobial Stewardship

- Active reserch and isolation of colonized patients & Isolation of infected patients

- Suitable Personal Protective Equipment

- Enhanced Environmental Cleaning

Involvement of patient and patient organizations in the ALLIANCE

http://www.ospfe.it