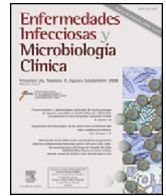




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Original article

VINCat program: Impact of a surveillance program on alcohol-based hand rub consumption in acute care facilities in Catalonia, Spain



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ABSTRACT

Aim: Hand hygiene is regarded as the cornerstone for preventing healthcare-associated infections. This study assesses trends in alcohol-based hand rub (ABHR) consumption for hand hygiene and availability of dispensers at the point of care (POC) in acute care hospitals in Catalonia, as part of the VINCat program. **Methods:** Data were collected from 2014 to 2022 in 69 hospitals, categorized by size and type, including large, medium, small, and specialized facilities. ABHR consumption was measured in liters per 1000 patient-days, with data segmented into intensive care units (ICUs) and non-ICU wards. Hospital infection control personnel determined the availability of ABHR solutions at the POC through yearly point prevalence surveys.

Results: The study found a significant increase in ABHR consumption over time, with usage rising from 22.8 L/1000 patient-days in the 2014–2017 period to 39.9 L in 2018–2022, representing a 75% increase. The most significant growth was observed in ICUs, where ABHR use nearly doubled. ABHR consumption also spiked during the COVID-19 pandemic in 2020, with large hospitals showing the highest levels of usage. Additionally, the availability of ABHR dispensers at the POC increased, particularly in non-ICU wards and small hospitals.

Conclusions: The findings underscore the role of sustained hand hygiene efforts, including increased ABHR availability at the POC, as essential components of infection prevention. These efforts are especially crucial in high-risk units such as ICUs and in smaller hospitals, where resources and compliance may be limited.

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¹ The members of this VINCat Programme Hand Hygiene group appear in [Appendix 1](#).

Programa VINCat: monitorización del consumo de soluciones hidroalcohólicas en los hospitales de atención aguda en Cataluña, España

R E S U M E N

Palabras clave:

Higiene de manos

Solución hidroalcohólica (SHA)

Prevención de infecciones

Objetivo: La higiene de manos se considera la piedra angular de la prevención de las infecciones relacionadas con la atención sanitaria. Este estudio evalúa las tendencias en el consumo de soluciones hidroalcohólicas (SHA) y la disponibilidad de dispensadores en el punto de atención (PA) en los hospitales de atención aguda en Cataluña, como parte del programa VINCat.

Métodos: Se recopilaron datos de 2014 a 2022 en 69 hospitales, categorizados por tamaño y tipo, incluyendo grandes, medianos, pequeños y especializados. El consumo de SHA se midió en litros por cada 1.000 días de estancia, con datos segmentados entre unidades de cuidados intensivos (UCI) y no UCI. La disponibilidad de SHA en el PA se determinó mediante encuestas anuales de prevalencia.

Resultados: Se observó un incremento significativo en el consumo de SHA de 22,8 l por cada 1.000 días de estancia en el período 2014–2017 a 39,9 l en 2018–2022 (incremento del 75%). El mayor aumento se observó en las UCI, donde el uso de SHA casi se duplicó. El consumo de SHA también aumentó considerablemente durante la pandemia de COVID-19 en 2020, con los hospitales grandes mostrando los niveles más altos de uso. Además, la disponibilidad de dispensadores de SHA en el PA aumentó, especialmente en las no UCI y en hospitales pequeños.

Conclusiones: Los hallazgos subrayan la importancia de mantener los esfuerzos en higiene de manos, especialmente en los entornos de alto riesgo y en los hospitales más pequeños, donde los recursos y el cumplimiento pueden ser limitados.

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Introduction

Healthcare-associated infections (HAIs) are infections acquired within healthcare settings, often due to invasive procedures performed during patient care.¹ These infections represent a significant threat to patient safety, ranking among the most common adverse events in healthcare.² Additionally, many of these infections are caused by multidrug-resistant (MDR) microorganisms, which pose a significant concern due to their potential for spread and the limited treatment options available.³ The impact of HAIs extends beyond patient safety, contributing to increased morbidity and mortality rates, diminished quality of life, and escalating healthcare costs. As a result, HAIs place a substantial burden on healthcare systems worldwide.⁴

The 2022 Global Report on Infection Prevention and Control by the World Health Organization (WHO) estimated that between 7% and 10% of patients will acquire an HAI during their hospital stay.⁵ In Catalonia, data from the VINCat program surveillance system revealed a prevalence of 7.10% of HAIs in acute care hospitals in 2022.⁶ Considering the nearly 19,000 hospital acute care beds, this figure suggests that thousands of patients are affected by HAIs each year in our region alone.

Notably, the WHO report emphasizes that effective and cost-efficient practices can prevent up to 70% of HAIs. Hand hygiene is considered the cornerstone of HAI prevention and is recognized as the most effective measure to reduce transmission. In 2009, the WHO introduced its “Five Moments” model for hand hygiene, specifically aimed at minimizing the risk of microorganism transmission in hospitals.⁷ To promote compliance with hand hygiene among healthcare professionals, the WHO recommends implementing multimodal strategies, which include (1) system change through the introduction of alcohol-based hand rubs (ABHR), (2) training and education, (3) evaluation and feedback, (4) reminders in the workplace, and (5) the creation of a safety climate. Moreover, ABHR consumption is a valuable surrogate parameter for hand hygiene performance and can be easily tracked in the healthcare setting.⁸

A vital component of these strategies is ensuring that ABHR is readily available and accessible at the point of care (POC), where the patient, healthcare worker, and care intersect.⁹ The placement

of ABHR dispensers is critical in promoting hand hygiene practices and improving compliance. Studies have shown that the strategic placement of dispensers can significantly impact compliance rates more than the mere quantity of dispensers available.¹⁰ Nonetheless, sustained improvement in hand hygiene compliance requires implementing comprehensive multimodal strategies, where easy access to ABHR is a key aspect of the system change component of the multimodal strategy recommended by the WHO.

This study aims to assess trends in ABHR consumption from 2014 to 2022 and evaluate the availability of ABHR solutions at the POC in acute care hospitals in Catalonia. By analyzing data from the VINCat program, we seek to understand the impact of these efforts on improving hand hygiene compliance and infection prevention practices across different hospital settings.

Methods

The VINCat program, established in 2006 as the infection prevention and control program of HAIs by the Catalan Department of Health, has monitored hand hygiene compliance in Catalan hospitals since 2014.¹¹ Specifically, the program tracks ABHR consumption and availability of dispensers at the POC as indirect indicators of hand hygiene adherence.

ABHR consumption: ABHR consumption was calculated using liters per 1000 patient-days. Leading hospital infection control personnel provided retrospective yearly data on ABHR consumption in each participating hospital from 2014 to 2022. A total of sixty-nine hospitals contributed to the study. Hospitals were categorized by size as follows: large university hospitals (>500 beds, 9 centers), medium hospitals (200–500 beds, 18 centers), small hospitals (<200 beds, 37 centers), and specialized hospitals (three oncologic, one urologic, one neurorehabilitation centers). Data were collected annually from each hospital and segmented into two main categories, intensive care units (ICUs) and medical or surgical wards, and compared in two distinct periods: Period 1 (2014–2017) and Period 2 (2018–2022). The hospital infection control personnel determined the availability of ABHR solutions at the POC through yearly point prevalence surveys. Adequate POC for ABHR solutions was developed in a consensus document between the VINCat HM group and the Catalan Association for Infection Control (ACICI)

and¹² was standardized through VINCat hospitals and considered correct when located less than 2 m away from the patient's bed, visible and accessible without barriers or elements that hinder or prevent access.

Ethical issues

The study complied with the principles of the Declaration of Helsinki, with international human rights considerations, and with the legislation regulating biomedicine and personal data protection. All data were treated as confidential, and records were accessed anonymously. The study was approved by the Ethics Committee of Bellvitge Hospital (Ref. PR066/18). Patient data were anonymized, so the Ethics Committee for Clinical Research waived the requirement for informed consent.

Statistical analysis

ABHR consumption was calculated as an incidence rate, expressed in liters per 1000 patient-days. The availability of ABHR dispensers at the POC was reported as a percentage of hospital beds equipped with dispensers. Differences in dispenser prevalence between the two study periods (2014–2017 and 2018–2022) were analyzed using the chi-square test. Crude incidence rate ratios (cIRRs) with 95% confidence intervals (CI) were used to compare ABHR consumption between the two periods. To evaluate the strength and direction of the monotonic relationship between ABHR consumption and the availability of ABHR dispensers at the POC over the years, we performed a Spearman correlation (ρ). LOESS smoothing was applied to graphs to better illustrate trends over time in both intensive care units (ICUs) and non-ICU wards.

A significance level of 0.05 was applied to all statistical tests. The results were analyzed using the R statistical software version 4.2.2, developed by The R Foundation in Vienna, Austria.

Results

Data on ABHR consumption across different types of hospitals and periods is shown in Table 1. Over the entire study period (2014–2022), the overall consumption was 32.4 L/1000 patient-days, with significantly higher usage in ICUs (90.7 L/1000 patient-days) compared to non-ICU wards (28.0 L/1000 patient-days). Important variations were observed between hospital types. Large hospitals had the highest ABHR consumption (41.4 L/1000 patient-days), followed by specialty hospitals (31.7 L/1000 patient-days) compared to lower consumption in medium and small hospitals. Overall consumption increased from 22.8 L/1000 patient-days in Period 1 to 39.9 L/1000 patient-days in Period 2 (incidence rate ratio (IRR): 1.75 (95% CI: 1.74–1.76), indicating a 75% increase in ABHR use between the two periods. The higher increase between the two periods was observed in ICUs where ABHR use rose from 58.7 L/1000 patient-days to 112.0 L/1000 patient-days (IRR 1.91). The ICUs from large hospitals showed the highest usage increase from 63.3 L/1000 patient-days in Period 1 to 125.7 L/1000 patient-days in Period 2 (IRR 1.98) and almost doubled their consumption.

The annual consumption of ABHR from 2014 to 2022, categorized by hospital groups, is shown in Fig. 1. Across all hospital sizes, ABHR consumption significantly increased in 2020, coinciding with the onset of the COVID-19 pandemic. By 2022, global consumption levels returned to figures similar to those observed in 2019. In large hospitals, consumption levels remained higher than in the early study years (2014–2017) but did not exceed levels observed in 2018–2019. For small and specialized hospitals, consumption levels post-2020 either approached or fell below pre-pandemic

Table 1
Trends in alcohol-based hand rub (ABHR) consumption (liters per 1000 patient-days).

Unit and hospital size	Hospitals	Overall 2014–2022				Period 1 2014–2017				Period 2 2018–2022			
		L	Patient-days	L/1000 PD	Hospitals	L	Patient-days	L/1000 PD	Hospitals	L	Patient-days	L/1000 PD	cIRR (95% CI)
Global	69	1,060,407	32,686,816	32.4	66	327,729	14,343,161	22.8	69	732,678	18,343,655	39.9	1.75 (1.74–1.76)
Large	9	550,083	13,271,247	41.4	9	171,741	6,131,594	28.0	9	378,342	7,139,653	53.0	1.89 (1.88–1.90)
Medium	18	323,059	11,890,023	27.2	18	100,744	4,985,980	20.2	18	222,315	6,904,043	32.2	1.59 (1.58–1.61)
Small	37	159,847	6,687,620	23.9	34	47,656	2,896,194	16.5	37	112,191	3,791,426	29.6	1.80 (1.78–1.82)
Specialty hospital	5	27,418	837,926	32.7	5	7,588	329,393	23.0	5	19,83	508,533	39.0	1.69 (1.65–1.74)
ICU	37	211,653	2,334,018	90.7	33	54,775	932,735	58.7	39	156,878	1,401,283	112.0	1.91 (1.89–1.92)
Large	9	139,293	1,396,873	99.7	8	36,868	582,059	63.3	9	102,425	814,814	125.7	1.98 (1.96–2.01)
Medium	17	64,755	816,385	79.3	17	16,43	304,322	54.0	17	48,325	512,063	94.4	1.75 (1.72–1.78)
Small	11	7,605	120,76	63.0	8	1,477	46,354	31.9	11	6,128	74,406	82.4	2.58 (2.44–2.74)
Non-ICU	69	848,754	30,352,798	28.0	66	272,954	13,410,426	20.4	69	575.8	16,942,372	34.0	1.67 (1.66–1.68)
Large	9	410,79	11,874,374	34.6	9	134,873	5,549,535	24.3	9	275,917	6,324,839	43.6	1.79 (1.78–1.81)
Medium	18	258,304	11,073,638	23.3	18	84,314	4,681,658	18.0	18	173,99	6,391,980	27.2	1.51 (1.50–1.52)
Small	37	152,242	6,566,860	23.2	34	46,179	2,849,840	16.2	37	106,063	3,717,020	28.5	1.76 (1.74–1.78)
Specialty hospital	5	27,418	837,926	32.7	5	7,588	329,393	23.0	5	19,83	508,533	39.0	1.69 (1.65–1.74)

L: liters; PD: patient-days; cIRR: crude incidence rate ratio; CI: confidence interval.

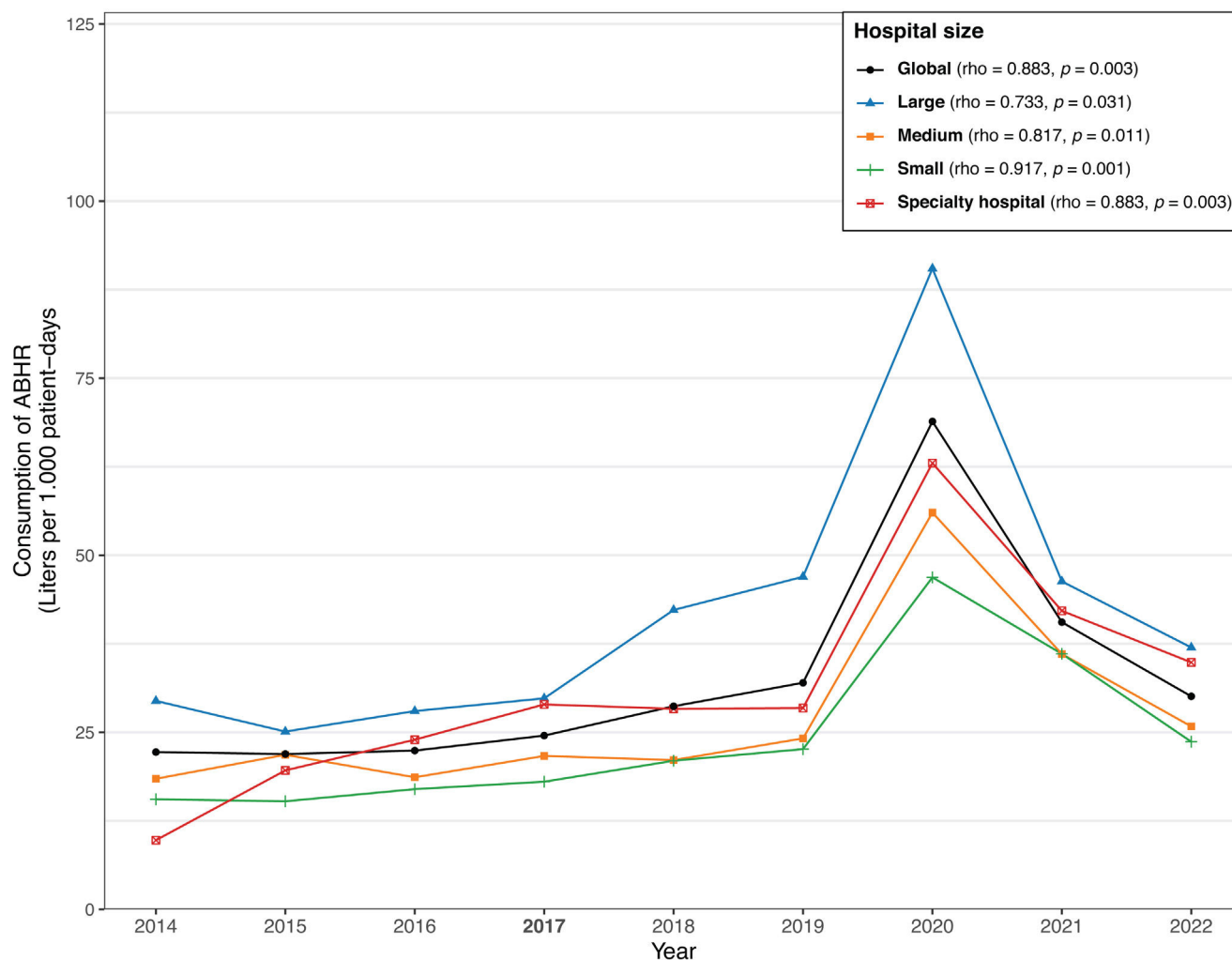


Fig. 1. Trends in ABHR consumption categorized by hospital groups from 2014 to 2022.

levels. Fig. 2 illustrates the trends in ABHR consumption between ICUs and non-ICU wards from 2014 to 2022. Overall, ABHR consumption has risen significantly in 2020 in both ICUs and non-ICU wards, with ICUs showing higher levels of use, almost 175 L/1000 patient-days. The distribution of ABHR consumption across 69 hospitals, categorized by size: large, medium, small, and specialty hospitals is shown in [supplementary Fig. S4](#). Significant variability in ABHR consumption both within and between hospital size categories.

The prevalence of hospital beds with ABHR dispensers at the POC, segmented by hospital groups and periods is shown in [Table 2](#). The global prevalence of beds with ABHR dispensers at POC increased from 76.8% in Period 1 to 85.6% in Period 2, indicating a significant rise in availability over time ($p < 0.001$). Focusing on the type of ward, the overall prevalence of dispensers at POC remained stable in ICUs with negligible change between the two periods. Non-ICU units showed a significant increase from 75.3% in Period 1 to 84.5% in Period 2 ($p < 0.001$). The increased availability of dispensers at the POC across all hospital sizes was particularly pronounced in small hospitals ([Fig. 3](#)).

Discussion

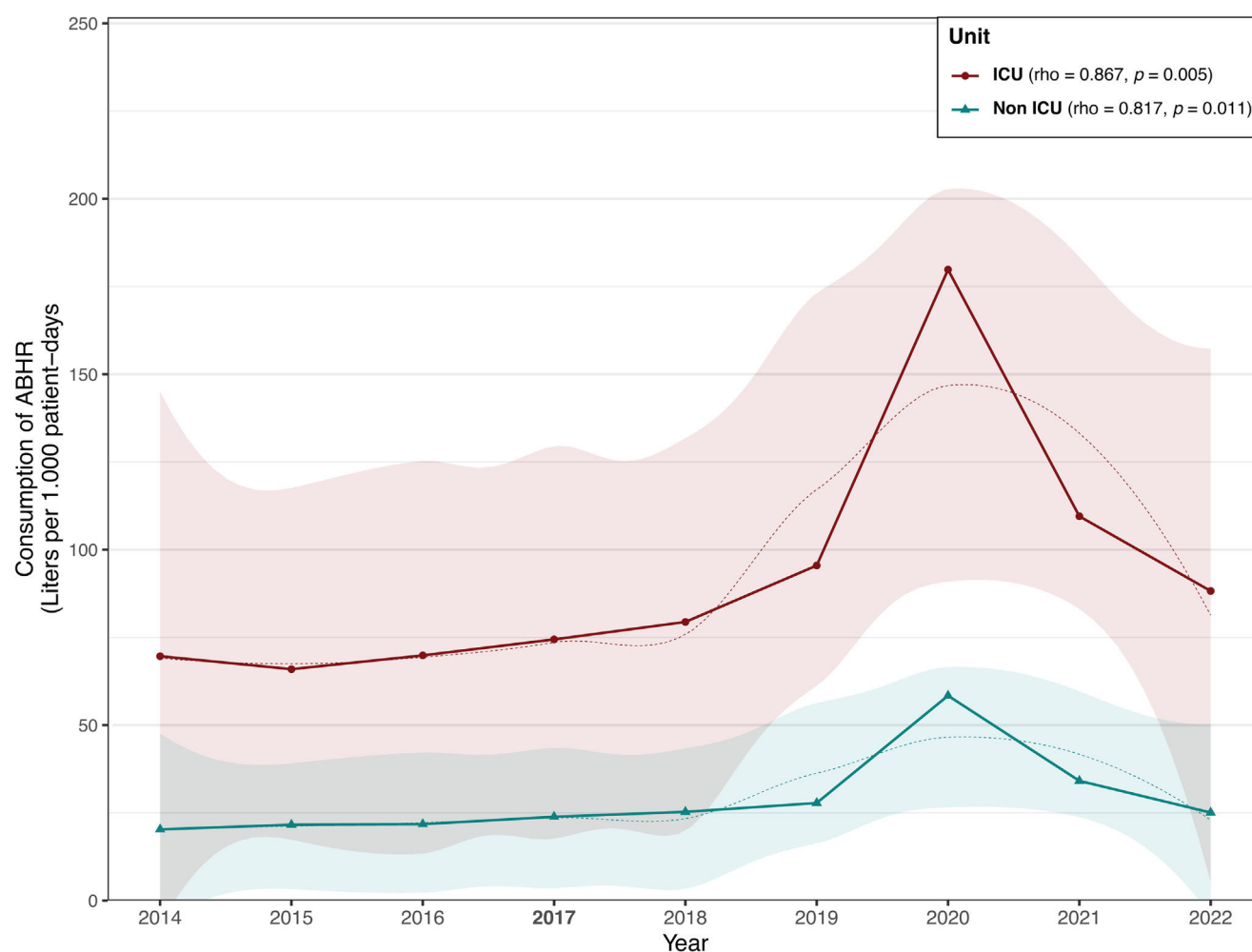
The study highlights significant trends in ABHR consumption across participating VINCat hospitals, with an overall increase in ABHR use between 2014 and 2022 in all hospital groups. The

increase in ABHR use aligns with global initiatives and recommendations from organizations such as the WHO that emphasize the importance of hand hygiene in reducing HAIs.¹³

The consumption of ABHR varied across different countries in Europe. In a broader European study (PROHIBIT), the median ICU ABHR consumption was 66 mL per patient-day, with considerable variation by country. Our findings, with a consumption rate of 90.7 L/1000 patient-days in ICUs, place Catalonia among the higher consumers of ABHR in Europe, comparable to Germany but significantly higher than the European mean.^{14,15}

The data analysis suggests that hospital size plays a significant role in ABHR consumption. Larger hospitals demonstrated higher ABHR consumption per patient-day compared to smaller hospitals. This could be attributed to these facilities' more complex patient care needs and higher patient volumes.

One key observation from the study is the dramatic rise in ABHR consumption during the COVID-19 pandemic in 2020. The surge in ABHR consumption during the COVID-19 pandemic mirrors global trends, reflecting heightened hand hygiene practices during the crisis. However, by 2022, global consumption levels returned to figures similar to those observed in 2019, suggesting a normalization of hand hygiene practices as the pandemic's immediate impact subsided. This trend was particularly pronounced in small and specialized hospitals, where consumption levels either approached or fell below pre-pandemic figures, potentially due to resource limitations or decreased prioritization of hand hygiene.



The dashed line shows the LOESS trend, and the shaded area represents its 95% confidence interval.

Fig. 2. Trends in ABHR consumption between ICUs and non-ICU wards from 2014 to 2022.

Table 2

Trends in the prevalence of beds equipped with alcohol-based preparation dispensers at the point of care.

Unit and hospital size	Overall 2014–2022				Period 1 2014–2017				Period 2 2018–2022				p-Value ^a
	Hospitals	Beds	Dispensers	Prevalence (%)	Hospitals	Beds	Dispensers	Prevalence (%)	Hospitals	Beds	Dispensers	Prevalence (%)	
<i>Global</i>	68	121,948	99,633	81.7	66	53,807	41,303	76.8	68	68,141	58,33	85.6	<0.001
Large	9	46,547	38,471	82.6	9	21,148	16,303	77.1	9	25,399	22,168	87.3	<0.001
Medium	18	44,39	35,9	80.9	18	19,055	15,082	79.1	18	25,335	20,818	82.2	0.0093
Small	36	28,696	22,967	80.0	34	12,596	8,992	71.4	36	16,1	13,975	86.8	<0.001
Specialty hospital	5	2,315	2,295	99.1	5	1,008	926	91.9	5	1,307	1,369	104.7	0.0302
<i>ICU</i>	35	8,815	8,687	98.5	34	3,413	3,368	98.7	35	5,402	5,319	98.5	0.9555
Large	8	4,857	4,749	97.8	9	1,845	1,816	98.4	9	3,012	2,933	97.4	0.8146
Medium	17	3,536	3,475	98.3	17	1,393	1,385	99.4	17	2,143	2,09	97.5	0.7111
Small	9	422	463	109.7	8	175	167	95.4	9	247	296	119.8	0.1144
<i>Non-ICU</i>	68	113,133	90,946	80.4	66	50,394	37,935	75.3	68	62,739	53,011	84.5	<0.001
Large	9	41,69	33,722	80.9	9	19,303	14,487	75.1	9	22,387	19,235	85.9	<0.001
Medium	18	40,854	32,425	79.4	18	17,662	13,697	77.6	18	23,192	18,728	80.8	0.0073
Small	36	28,274	22,504	79.6	34	12,421	8,825	71.0	36	15,853	13,679	86.3	<0.001
Specialty hospital	5	2,315	2,295	99.1	5	1,008	926	91.9	5	1,307	1,369	104.7	0.0302

^a Pearson chi-squared test.

In contrast, large hospitals demonstrated sustained increases compared to the early study years (2014–2017), although consumption did not exceed 2018–2019 levels. These findings underscore the importance of maintaining robust hand hygiene programs, particularly in smaller facilities, to sustain compliance during non-crisis

periods. For instance, a study on COVID-19 and ABHR effectiveness highlighted the critical role of hand hygiene in controlling virus transmission, with WHO-recommended formulations showing strong virucidal activity against SARS-CoV-2.¹⁶ This reinforces the heightened ABHR use during the pandemic, as seen in our data

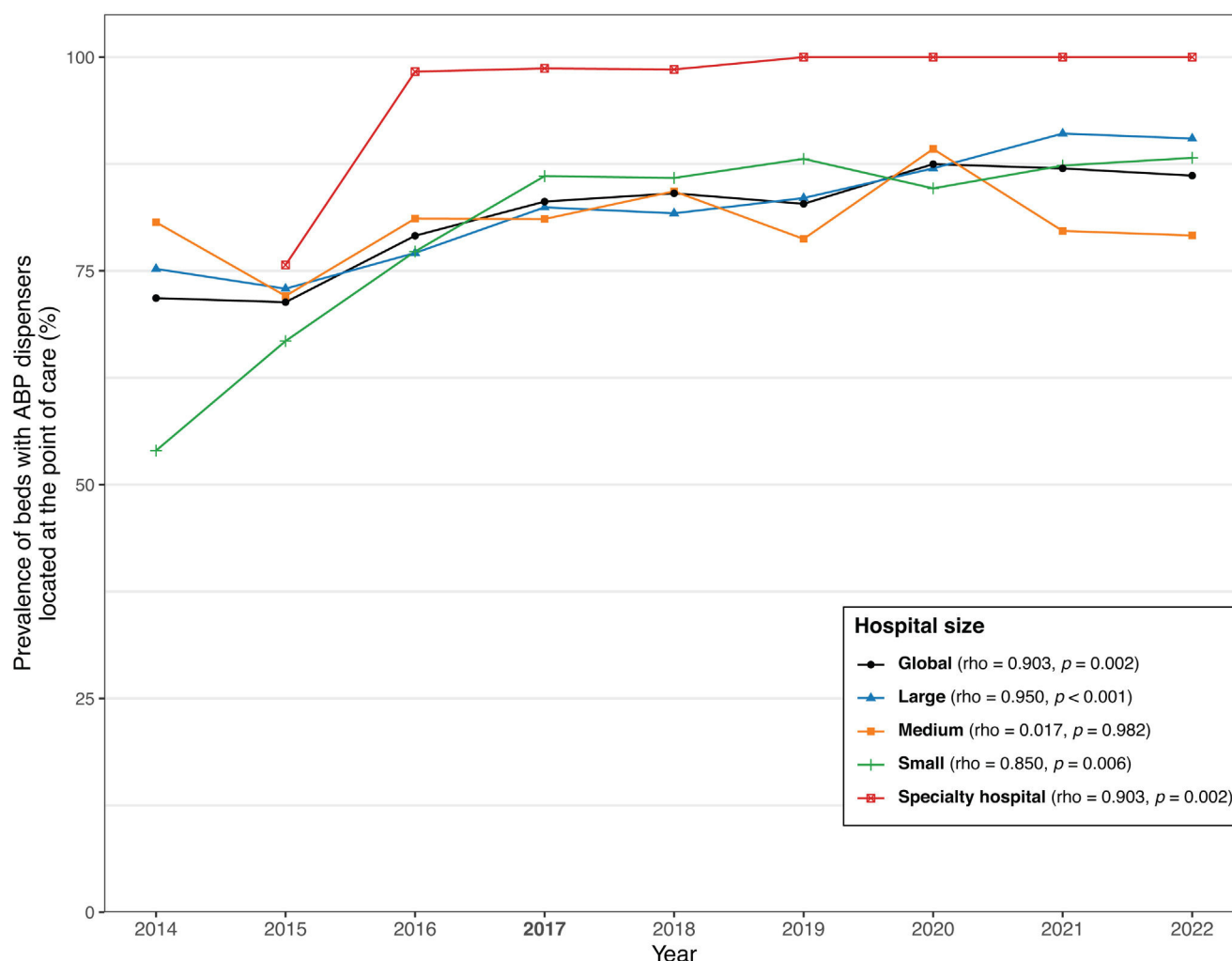


Fig. 3. Trends in the availability of ABHR solutions at the point of care, categorized by hospital groups from 2014 to 2022.

and other European countries like Italy, where ABHR consumption peaked in 2020 but decreased significantly by 2022.¹⁷

Our study showed a notable improvement in the availability of ABHR dispensers at POC. This increase in availability is crucial as it facilitates compliance with hand hygiene practices by making ABHR more accessible to healthcare workers. The results indicate that more hospitals, especially smaller ones, have made efforts to increase the number of ABHR dispensers, which is an essential component of WHO's multimodal strategy for hand hygiene improvement.^{7,18}

Our study has several strengths, it provides ABHR consumption across a large number of hospitals in Catalonia, representing various hospital sizes and specializations over an extended period. This allows for a robust understanding of long-term trends in hand hygiene practices. Our study has captured the impact of COVID-19 and the significant increase in ABHR consumption. In addition to tracking ABHR consumption, the study evaluates the availability of ABHR dispensers at the POC. This is a key strength as it connects consumption data with accessibility, a vital component of hand hygiene compliance.

Regarding limitations, our study does not include direct observation of healthcare workers' hand hygiene practices. This could provide a more complete picture of actual compliance. Furthermore, the study relies on data provided by hospital infection control personnel. There is a possibility of inconsistencies in reporting ABHR consumption and dispenser availability, especially given the

variability in hospital sizes and resources. Finally, although the study is comprehensive for the region of Catalonia, its findings may not be fully applicable to other regions or countries with different healthcare systems, infection control policies, or levels of resources.

In conclusion, the study demonstrates that the VINCat program has successfully monitored and facilitated improvements in ABHR consumption and availability, contributing to enhanced hand hygiene compliance in Catalonia. The significant increases during the COVID-19 pandemic highlight the impact of global health crises on infection prevention practices.

Future efforts should focus on sustaining progress in high-risk settings such as ICUs while addressing gaps in compliance and accessibility in non-ICU wards, where challenges may still persist.

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Conflicts of interest

The authors declare no conflicts of interest.

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Appendix 1. Members of VINCat Programme Hand Hygiene Group and Infection Control Teams participating in the programme:

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Appendix B. Supplementary data

Supplementary data associated with this article can be found in the online version available at <https://doi.org/10.1016/j.eimc.2025.02.001>.

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