

# Mobile phone use in health care units as potential vectors of viral infections

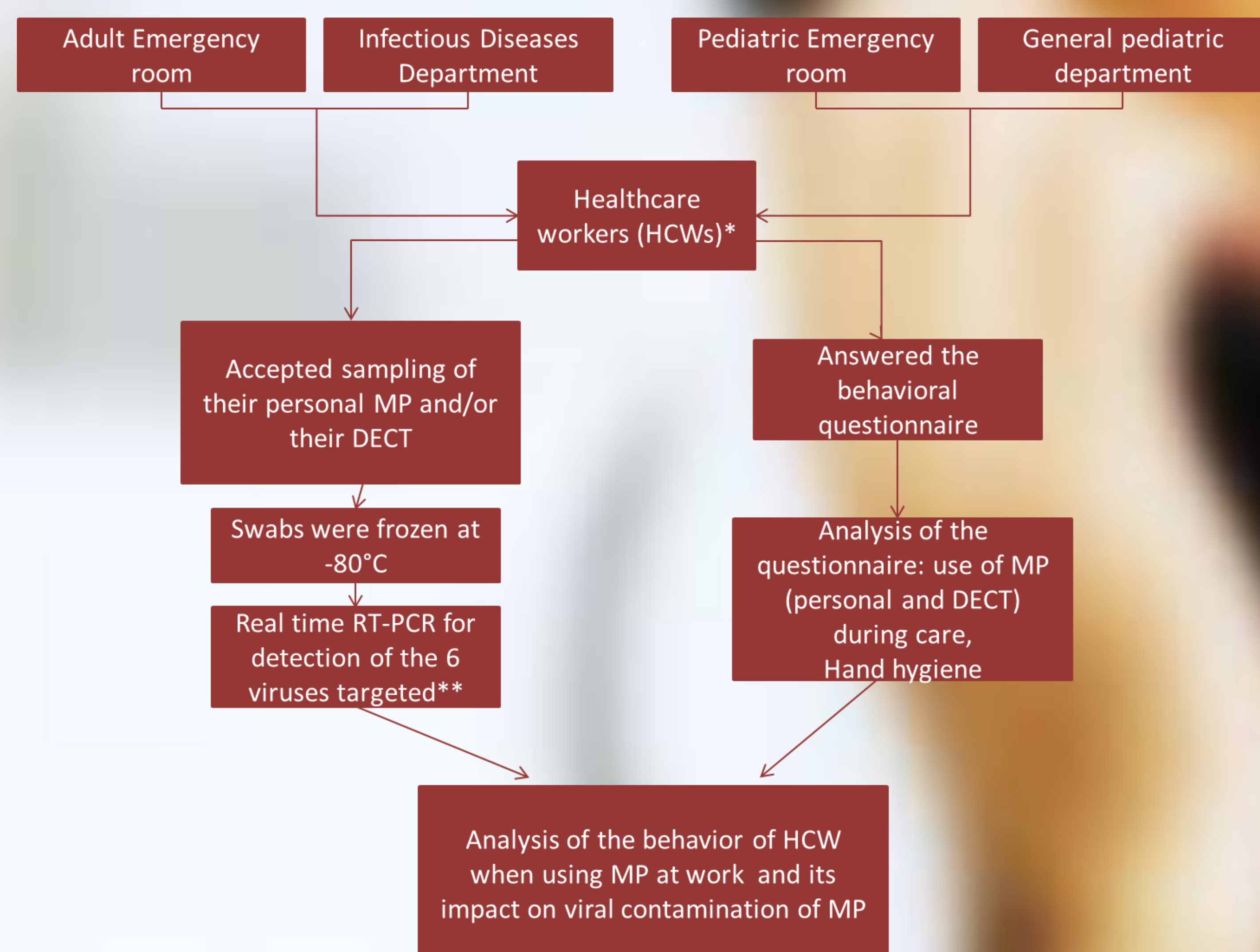
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## Background and aims of the study

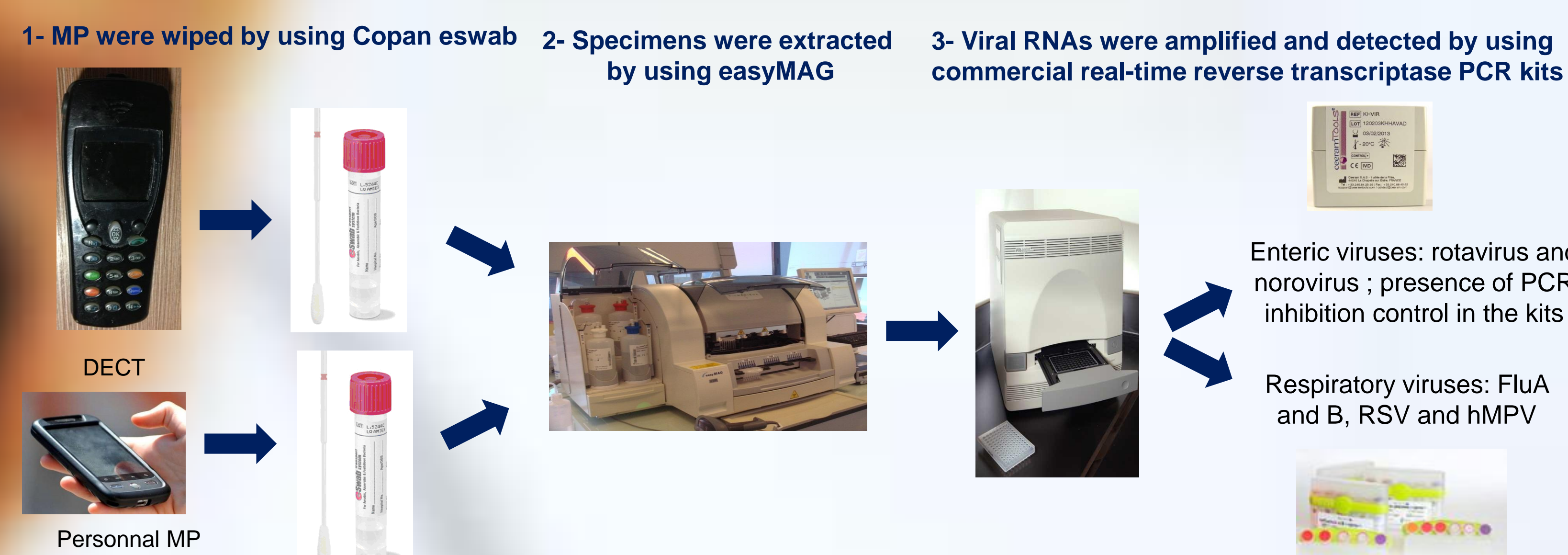
Mobile phones (MP) use by healthcare workers (HCWs) is of great interest since 2000 (Brady et al., J Hosp Infect 2009). Personal MP as well as professional ones (most of them being Digital enhanced Cordless Telephones (DECT)) are commonly used by HCWs (Visvanathan et al., Telemed J E Health 2011). They can be considered as medical devices, constituting one of the main tool handled in the HCW pocket. The use of such MP occurs even in the presence of patients. The role of MP in the transmission of bacteria has been reported, with 9 to 25% of MP used by HCWs being contaminated by pathogen bacteria (Brady et al., J Hosp Infect 2009). To date, no study reporting the role of MP in the transmission of viruses has been published. Epidemic viruses circulating during the winter period can be responsible for nosocomial infections, especially by hands transmission. Contaminations of HCWs hands by viruses may occur by contact either with contaminated fluids or surfaces. Rotavirus, norovirus and influenza viruses are known to persist on surfaces and devices. The aims of this study were (i) to record the use and cleaning practices of MP by HCWs in 4 adult or pediatric departments, (ii) to detect viral RNA from 6 epidemic viruses on MP, (iii) to rely MP contamination with hygiene practices.

## Methods



**Figure 1. Design of the study.** HCW were asked to answer to the questionnaire while their mobile phone(s) (MP) (professional or personal one(s)) were wiped for further virological analysis. Professional MP were Digital Enhanced Cordless Telephones (DECT); \*physicians, residents, nurses, nurse-assistants; \*\* rotavirus, norovirus, respiratory syncytial virus, influenza viruses A and B, human metapneumovirus

An anonymous questionnaire related to the use and cleaning practices of MP at hospital was proposed to the HCWs of 4 adult and pediatric departments. Physicians and residents were considered as medical staff; nurses and nurse assistants were considered as paramedical HCWs. Students were excluded from this study. The design of the study is summarized in **Figure 1**. The MP (personal and/or professional ones) were wiped with a 480CE e-swab (Copan) and the virological analysis is depicted in **Figure 2**. Statistical analysis was performed by using SPSS software (20.0, Chicago, Illinois). The molecular results were analysed blindly to the results of the behaviour survey.



**Figure 2. Strategy used for the virological analysis.** After sampling, the eswabs were stored at -80°C. A volume of 200µl of transport medium was extracted by using the Specific B protocol on the NUCLESENS easyMAG instrument (bioMérieux, Marcy l'Etoile, France). The elution volume was of 50 µL. The amplification step was performed immediately after extraction, without freezing of nucleic acids. Ten µl of extract were mixed to ready-to-use commercial mastermix and the one-step reverse transcription and PCR reactions were performed on ABI7500fast real-time cyclers according to manufacturer's recommendations. The enteric viruses (rotavirus and norovirus) were detected by using KHRV and KHPNOV kits from Ceeram (La Chapelle sur Erdre, France); the respiratory viruses (influenza A and B viruses, respiratory syncytial virus (RSV) and human metapneumovirus (hMPV)) were detected by using the MWS kits from bioMérieux.

## Results

### Behavior analysis:

A total of 134 questionnaires were recorded from physicians (38 seniors and 35 residents) and paramedical staff (33 nurses and 28 assistant nurses) who worked in either adults (n=67) or pediatric (n=67) departments. The result of the analysis is presented in **Table 1**. All HCWs declared to be conscious that phones could host infectious agents. Medical personnel used their personal MP more frequently than paramedical HCWs. Nurses and physicians seniors used more frequently than other HCWs mobile phones (personal and DECT) during care. Senior physicians received more phone calls than the other categories of HCWs (>10 per working day). They declared to clean their phones more frequently after use than other HCWs.

### Virological analysis:

Viral RNA was detected on 42 of the 109 sampled phones (38.5%): rotavirus was incriminated in 39 cases (92.8%), RSV in three cases and hMPV in one case (**Figure 3**). One DECT taken from a senior physician working in the pediatric emergency room was found positive for both RSV and rotavirus. Overall, the MP detected virus positive were mostly from HCW working in pediatric departments (**Figure 4**).

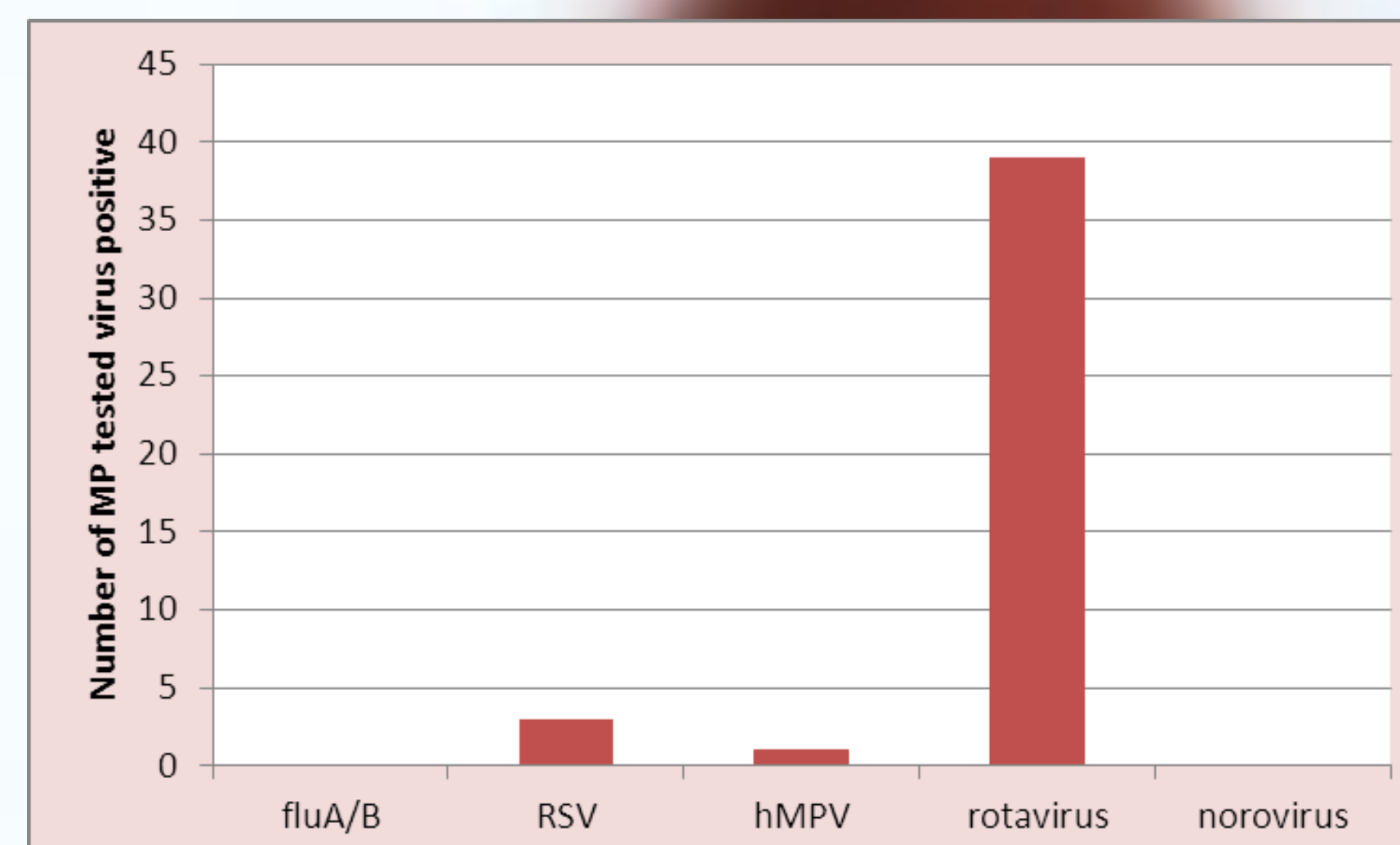
### Statistical analysis:

By both uni and multivariate analyses, the presence of viral RNA was significantly associated with mobile phones from the pediatric HCWs ( $P < 0.0001$ ; RR increased by 2.76) and inversely correlated to the high frequency (more than 10 per day) of phone calls ( $P < 0.0001$ ; RR decreased by 0.58).

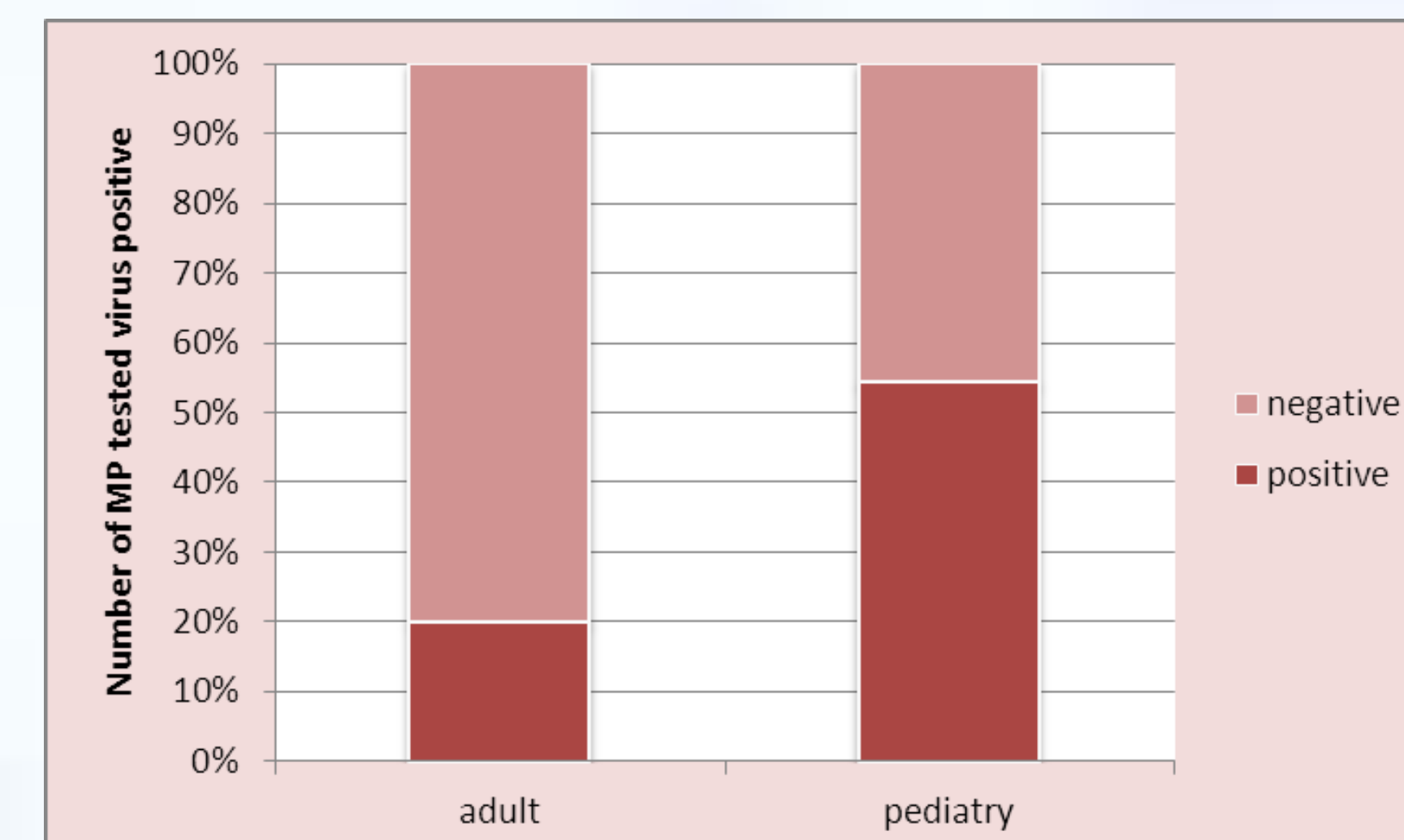
**Table 1. Declared practices of hygiene procedures by HCWs in Saint-Etienne University Hospital.**

Declaration by HCWs in the questionnaire	Paramedical staff		Medical staff		P value
	nurses N=33	nurse-assistants N=28	Senior physicians N=38	Residents N=35	
Use of their personal MP at hospital (%)	5 (15.2)	7 (25)	28 (73.7)	20 (57.1)	$p < 0.0001$ *
Use of MP (personal+professional) during care (%)	26 (81.3)	13 (46.4)	33 (86.8)	16 (45.7)	$p < 0.0001$ **
Halt a care to answer a call on MP (personal+professional) (%)	22 (68.7)	14 (50)	35 (92.1)	24 (68.6)	$p = 0.007$ *
Never desinfect their hands after using MP (personal+professional) (%)	14 (42.4)	5 (18.5)	12 (31.6)	20 (57.1)	$p = 0.01$
Never desinfect their personal MP (%)	11/28 (39.3)	12/22 (54.5)	14/35 (40)	12/34 (35.3)	NS
Never desinfect their professional MP (%)	8/31 (25.8)	12/26 (46.1)	10/37 (27)	21/31 (67.7)	$p = 0.001$ **
To receive > 10 calls by worked day (%)	23 (69.7)	17 (60.7)	34 (89.5)	17 (48.6)	$p = 0.002$ ***

\* medical vs paramedical staff; \*\* senior physicians and nurses vs other HCWs; \*\*\* senior physicians vs other HCWs



**Figure 3. Virus detected on MP of HCWs.**



**Figure 4. Repartition of MP in health care departments according to contamination status.**

## Conclusion

These results suggest that the important viral load observed in pediatric wards during rotavirus outbreaks plays a major role in the contamination of MP. Indeed rotavirus have been previously found able to survive in hospital surfaces for weeks (Ganime et al., Am J infect Control 2010). What was less expected was the lower level of contamination of MP used very frequently, which could be explained by a more frequent disinfection of these devices according to the declarations of senior physicians. In conclusion, these results incite to reinforce the measures of hygiene regarding MP use and cleaning in wards during the periods of epidemics such as rotavirus circulation, with a special attention to episodically used devices that are less prone to be correctly disinfected.



### Thanks to:

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