

A multimodal intervention to improve hand hygiene compliance in peripheral wards of a tertiary care university centre: a cluster randomised controlled trial

Supplementary material

Table S1 Structural characteristics of wards by study group

Parameter		Intervention group	Control group	Total
Number of wards (total)		10	10	20
Number of medical wards		9	7	16
	Hematology/Oncology	2	3	5
	Cardiology	1	1	2
	Gastroenterology/ Nephrology	1	3	4
	Neurology	2	0	2
	Mixed/Other	3	0	3
Number of surgical wards		1	2	3
	Abdominal surgery	1	0	1
	Traumatology	0	1	1
	Gynecology/Urology	0	1	1
Number of interdisciplinary wards		0	1	1
Patient-days in the year 2018	Median	10545	10283	10928
	(Interquartile range)	(8814-14771)	(8425-15143)	(8814-15143)

Table S2 Hand hygiene (HH) opportunities and actions per WHO-moment, profession and aseptic procedure by study group and by study period

	Baseline period (cycle 1)		Intervention period (cycle 2-5)	
	Intervention group	Control group	Intervention group	Control group
WHO-moment	Number of HH-opportunities; Number of HH-actions; HH-compliance			
All	2494; 1482; 59%	2484; 1457; 59%	8215; 5033; 61%	8231; 4948; 60%
1 – before touching a patient	698; 393; 56%	658; 352; 53%	2346; 1408; 60%	2130; 1201; 56%
2 – before clean or aseptic procedure	380; 168; 44%	426; 193; 45%	1452; 764; 53%	1738; 905; 52%
3 – after body fluid exposure risk	171; 114; 67%	241; 145; 60%	527; 333; 63%	705; 482; 68%
4 – after touching a patient	791; 563; 71%	668; 499; 75%	2496; 1774; 71%	2414; 1685; 70%
5 – after touching patient surroundings	454; 244; 54%	491; 268; 55%	1394; 754; 54%	1244; 675; 54%
Profession	Number of HH-opportunities; Number of HH-actions; HH-compliance			
All	2494; 1482; 59%	2484; 1457; 59%	8215; 5033; 61%	8231; 4948; 60%
Nurses	1385; 838; 61%	1683; 992; 59%	5269; 3281; 62%	5459; 3374; 62%
Physicians	767; 523; 68%	641; 393; 61%	1887; 1232; 65%	2234; 1327; 59%
Others	342; 121; 35%	160; 72; 45%	1059; 520; 49%	538; 247; 46%
Aseptic procedure	Number of HH-opportunities; Number of HH-actions; HH-compliance			
All	380; 168; 44%	426; 193; 45%	1452; 764; 53%	1738; 905; 52%
Preparation of intravenous medication	51; 29; 57%	65; 27; 42%	274; 161; 59%	285; 189; 66%
Intravascular catheter manipulation	130; 58; 45%	196; 100; 51%	496; 271; 55%	691; 380; 55%
Insertion of intravascular catheter	78; 31; 40%	83; 31; 37%	405; 173; 43%	383; 164; 43%
(Wound-) Dressing change/ Manipulation of drainage	41; 22; 54%	62; 26; 42%	112; 65; 58%	213; 86; 40%
Contact with mucous membrane	30; 14; 47%	18; 8; 44%	139; 79; 57%	148; 75; 51%
Not specified	50; 14; 28%	2; 1; 50%	26; 15; 58%	18; 11; 61%

Table S3 Positive blood cultures stratified by pathogen per 1,000 patient-days by study group and by study period

Study group	Pathogen/pathogen-group	Baseline period		Intervention period		Follow-up period		Comparison		
		Number of isolates	Mean rate/1000 patient-days (CI95)	Number of isolates	Mean rate/1000 patient-days (CI95)	Number of isolates	Mean rate/1000 patient-days (CI95)	IRR (CI95), p-value Intervention vs. Baseline	IRR (CI95), p-value Follow-up vs. Baseline	IRR (CI95), p-value Follow-up vs. Intervention
Intervention	All	161	1.42 (1.21, 1.66)	172	1.46 (1.25, 1.70)	53	1.79 (1.34, 2.34)	1.03 (0.83, 1.27), 0.80	1.26 (0.92, 1.71), 0.15	1.23 (0.89, 1.66), 0.20
	Coagulase-negative staphylococci	24	0.21 (0.14, 0.32)	32	0.27 (0.19, 0.38)	10	0.34 (0.16, 0.62)	1.28 (0.76, 2.20), 0.36	1.61 (0.73, 3.28), 0.23	1.25 (0.58, 2.47), 0.54
	<i>Staphylococcus aureus</i>	31	0.27 (0.19, 0.39)	30	0.26 (0.17, 0.36)	4	0.14 (0.04, 0.35)	0.93 (0.56, 1.54), 0.78	0.51 (0.15, 1.29), 0.17	0.55 (0.16, 1.39), 0.23
	<i>Streptococcus</i> spp.	10	0.09 (0.04, 0.16)	14	0.12 (0.07, 0.20)	2	0.07 (0.01, 0.24)	1.34 (0.59, 3.14), 0.48	0.81 (0.11, 3.13), 0.79	0.60 (0.09, 2.19), 0.49
	<i>Enterococcus</i> spp.	18	0.16 (0.09, 0.25)	21	0.18 (0.11, 0.27)	4	0.14 (0.04, 0.35)	1.12 (0.59, 2.13), 0.72	0.88 (0.25, 2.37), 0.81	0.78 (0.22, 2.07), 0.64
	<i>Enterobacteriales</i>	50	0.44 (0.33, 0.58)	45	0.38 (0.28, 0.51)	15	0.51 (0.28, 0.84)	0.87 (0.58, 1.30), 0.48	1.15 (0.62, 2.01), 0.64	1.33 (0.72, 2.34), 0.35
	Non-fermenting bacteria	5	0.04 (0.01, 0.10)	3	0.03 (0.01, 0.07)	5	0.17 (0.05, 0.39)	0.59 (0.11, 2.50), 0.47	3.82 (1.03, 14.20), 0.05	6.49 (1.53, 33.63), 0.01
	<i>Candida albicans</i>	3	0.03 (0.01, 0.08)	7	0.06 (0.02, 0.12)	1	0.03 (0.00, 0.19)	2.18 (0.59, 10.69), 0.25	1.39 (0.05, 11.95), 0.80	0.64 (0.03, 3.67), 0.67
	Other <i>Candida</i> spp.	3	0.03 (0.01, 0.08)	3	0.03 (0.01, 0.07)	0	0.00 (0.00, 0.12)	0.96 (0.17, 5.60), 0.96	0 (0, 6.55), 0.50	0 (0, 6.81), 0.51
	Others	17	0.15 (0.09, 0.24)	17	0.14 (0.08, 0.23)	12	0.41 (0.21, 0.71)	0.96 (0.49, 1.91), 0.91	2.71 (1.25, 5.66), 0.01	2.81 (1.30, 5.88), <0.01
Control	All	226	1.98 (1.73, 2.26)	297	2.54 (2.26, 2.85)	59	2.08 (1.58, 2.68)	1.28 (1.08, 1.53), <0.01	1.05 (0.78, 1.39), 0.74	0.82 (0.61, 1.07), 0.15
	Coagulase-negative staphylococci	36	0.32 (0.22, 0.44)	53	0.45 (0.34, 0.59)	9	0.32 (0.14, 0.60)	1.44 (0.94, 2.21), 0.09	1.02 (0.46, 2.03), 0.96	0.71 (0.32, 1.37), 0.32
	<i>Staphylococcus aureus</i>	21	0.18 (0.11, 0.28)	29	0.25 (0.17, 0.36)	3	0.11 (0.02, 0.31)	1.35 (0.77, 2.40), 0.30	0.60 (0.14, 1.75), 0.38	0.45 (0.10, 1.26), 0.14
	<i>Streptococcus</i> spp.	14	0.12 (0.07, 0.21)	20	0.17 (0.10, 0.26)	3	0.11 (0.02, 0.31)	1.39 (0.70, 2.83), 0.34	0.90 (0.20, 2.78), 0.86	0.64 (0.15, 1.89), 0.46
	<i>Enterococcus</i> spp.	31	0.27 (0.18, 0.39)	42	0.36 (0.26, 0.49)	7	0.25 (0.10, 0.51)	1.32 (0.83, 2.12), 0.24	0.92 (0.37, 1.98), 0.85	0.70 (0.28, 1.46), 0.36
	<i>Enterobacteriales</i>	66	0.58 (0.45, 0.74)	85	0.73 (0.58, 0.90)	15	0.53 (0.30, 0.87)	1.26 (0.91, 1.74), 0.16	0.92 (0.50, 1.57), 0.77	0.73 (0.41, 1.23), 0.25

Non-fermenting bacteria	15	0.13 (0.07, 0.22)	15	0.13 (0.07, 0.21)	1	0.04 (0.00, 0.20)	0.98 (0.47, 2.03), 0.95	0.30 (0.01, 1.50), 0.17	0.31 (0.01, 1.53), 0.18
<i>Candida albicans</i>	8	0.07 (0.03, 0.14)	7	0.06 (0.02, 0.12)	4	0.14 (0.04, 0.36)	0.86 (0.30, 2.43), 0.77	2.05 (0.53, 6.64), 0.28	2.39 (0.60, 8.11), 0.20
Other <i>Candida</i> spp.	11	0.10 (0.05, 0.17)	12	0.10 (0.05, 0.18)	3	0.11 (0.02, 0.31)	1.06 (0.46, 2.47), 0.88	1.14 (0.25, 3.70), 0.85	1.07 (0.23, 3.41), 0.92
Others	24	0.21 (0.13, 0.31)	34	0.29 (0.20, 0.41)	14	0.49 (0.27, 0.83)	1.38 (0.82, 2.36), 0.22	2.35 (1.18, 4.51), 0.02	1.70 (0.88, 3.12), 0.11

Abbreviations: IRR – incidence rate ratio; CI95 – 95% confidence interval