

Supplementary Table 1. Results of ICU nurse knowledge, attitude and practice questionnaire

		Total	ICU A	ICU B	ICU C
Response rate		69 [n161, 42.9%]	25 [n33, 75.8%]	28 [n76, 36.8%]	16 [n52, 30.8%]
Age	1 20-29	7 [10.1%]	0 [0.0%]	6 [21.4%]	1 [6.3%]
	2 30-39	24 [34.8%]	5 [20.0%]	11 [39.3%]	8 [50.0%]
	3 40-49	18 [26.1%]	9 [36.0%]	7 [25.0%]	2 [12.5%]
	4 50-59	14 [20.3%]	9 [36.0%]	3 [10.7%]	2 [12.5%]
	5 60-65	4 [5.8%]	1 [4.0%]	1 [3.6%]	2 [12.5%]
	No response	2 [2.9%]	1 [4.0%]	0 [0.0%]	1 [6.3%]
Qualification *Additional qualification	1 Enrolled nurse	4 [5.8%]	1 [4.0%]	0 [0.0%]	3 [18.8%]
	2 RN diploma	55 [79.7%]	22 [88.0%]	21 [75.0%]	12 [75.0%]
	3 RN degree	8 [11.6%]	2 [8.0%]	5 [17.9%]	1 [6.3%]
	4 ICU diploma*	37 [53.6%]	24 [96.0%]	8 [28.6%]	5 [31.3%]
	No response	2 [2.9%]	0 [0.0%]	2 [7.1%]	0 [0.0%]
Year obtained nursing qualification	1980-1989	5 [7.2%]	1 [4.0%]	2 [7.1%]	1 [6.3%]
	1990-1999	6 [8.7%]	2 [8.0%]	0 [0.0%]	3 [18.8%]
	2000-2009	14 [20.3%]	11 [27.5%]	2 [7.1%]	1 [6.3%]
	2010 to 2020	31 [44.9%]	3 [12.0%]	19 [67.9%]	9 [56.3%]
	no answer	13 [18.8%]	8 [32.0%]	5 [17.9%]	2 [12.5%]
Year obtained ICU qualification	1980-1989	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	1990-1999	2 [2.9%]	2 [8.0%]	0 [0.0%]	0 [0.0%]
	2000-2009	16 [23.2%]	12 [48.0%]	3 [10.7%]	1 [6.3%]
	2010 to 2020	19 [27.5%]	10 [40.0%]	6 [21.4%]	3 [18.8%]
	no answer	32 [46.4%]	1 [4.0%]	19 [67.9%]	12 [75.0%]
Employed by hospital	1 Fulltime	60 [87.0%]	23 [92.0%]	28 [100%]	9 [56.3%]
	2 Part time	1 [1.4%]	0 [0.0%]	0 [0.0%]	1 [6.3%]
	No response	8 [11.6%]	2 [8.0%]	0 [0.0%]	6 [37.5%]
Agency	1 Regular booking at hospital	5 [7.2%]	0 [0.0%]	0 [0.0%]	5 [31.3%]
	2 Occasional booking by hospital	1 [1.4%]	0 [0.0%]	0 [0.0%]	1 [6.3%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
1. Did your training include information on antibiotic medicines?	1 no	2 [2.9%]	0 [0.0%]	2 [7.1%]	0 [0.0%]
	2 a lot	12 [17.4%]	4 [16.0%]	2 [7.1%]	6 [37.5%]
	3 a little	16 [23.2%]	2 [8.0%]	9 [32.1%]	5 [31.3%]
	4 yes	38 [55.1%]	18 [72.0%]	15 [53.6%]	5 [31.3%]
	No response	1 [1.4%]	1 [4.0%]	0 [0.0%]	0 [0.0%]
2. Did you have education on IV injections during your training?	1 yes	58 [84.1%]	23 [92.0%]	21 [75.0%]	14 [87.5%]
	2 sometimes	6 [8.7%]	1 [4.0%]	4 [14.3%]	1 [6.3%]
	3 no	3 [4.3%]	0 [0.0%]	2 [7.1%]	1 [6.3%]
	4 can't remember	1 [1.4%]	0 [0.0%]	1 [3.6%]	0 [0.0%]
	No response	1 [1.4%]	1 [4.0%]	0 [0.0%]	0 [0.0%]
3. Did you have practical training on intravenous infusions before you qualified?	1 no	12 [17.4%]	2 [8.0%]	7 [25.0%]	3 [18.8%]
	2 yes	50 [72.5%]	19 [76.0%]	20 [71.4%]	11 [68.8%]
	3 can't remember	5 [7.2%]	2 [8.0%]	1 [3.6%]	2 [12.5%]
	4 sometimes	1 [1.4%]	1 [4.0%]	0 [0.0%]	0 [0.0%]
	No response	1 [1.4%]	1 [4.0%]	0 [0.0%]	0 [0.0%]
4. a) Amoxicillin is a... [multiple answers possible]	1 cephalosporin	1 [1.4%]	1 [4.0%]	0 [0.0%]	0 [0.0%]
	2 antibiotic	46 [66.7%]	21 [84.0%]	11 [39.3%]	14 [87.5%]
	3 penicillin	36 [52.2%]	9 [36.0%]	15 [53.6%]	12 [75.0%]
	No response	9 [13.0%]	2 [8.0%]	6 [21.4%]	1 [6.3%]
b) Zinacef is a...	1 carbapenem	6 [8.7%]	2 [8.0%]	2 [7.1%]	2 [12.5%]
	2 cephalosporin	43 [62.3%]	17 [68.0%]	13 [46.4%]	13 [81.3%]
	3 echinocandin	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	No response	20 [29.0%]	6 [24.0%]	13 [46.42%]	1 [6.3%]
c) Carbapenems include...	1 Rocephin	11 [15.9%]	4 [16.0%]	7 [25.0%]	0 [0.0%]
	2 ertapenem	44 [63.8%]	17 [68.0%]	14 [50.0%]	13 [81.3%]
	3 antifungal	4 [5.8.0%]	1 [4.0%]	2 [7.1%]	1 [6.3%]
	No response	12 [17.4%]	4 [16.0%]	6 [21.4%]	2 [12.5%]
d) Meropenem is a...	1 narrow spectrum	5 [7.2%]	1 [4.0%]	3 [10.7%]	1 [6.3%]
	2 cephalosporin	9 [13.0%]	5 [20.0%]	3 [10.7%]	1 [6.3%]
	3 carbapenem	40 [58.0%]	15 [60.0%]	12 [42.9%]	13 [81.3%]
	No response	15 [21.7%]	4 [16.0%]	10 [35.7%]	1 [6.3%]
e) Augmentin contains...	1 antibiotic	27 [39.1%]	10 [40.0%]	6 [21.4%]	11 [68.8%]

[multiple answers possible]	2 clavulanic acid	29 [42.0%]	13 [52.0%]	10 [35.7%]	6 [37.5%]
	3 beta-lactamase inhibitor	7 [10.1%]	3 [12.0%]	2 [7.1%]	2 [12.5%]
	No response	16 [23.2%]	4 [16.0%]	11 [39.3%]	1 [6.3%]
5. How have you given antibiotics to patients? [multiple answers possible]	1 PO	50 [72.5%]	18 [72.0%]	18 [64.3%]	14 [87.5%]
	2 IM	32 [46.4%]	8 [32.0%]	14 [50.0%]	10 [62.5%]
	3 IV	64 [92.8%]	24 [96.0%]	27 [96.4%]	13 [81.3%]
	4 Infusion	45 [65.2%]	16 [64.0%]	18 [64.3%]	11 [68.8%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
6. Do you feel confident giving IV antibiotics to a patient?	1 sometimes	3 [4.3%]	1[4.0%]	2 [7.1%]	0 [0.0%]
	2 no	2 [2.9%]	1[4.0%]	0 [0.0%]	1 [6.3%]
	3 yes	56 [81.2%]	21 [84.0%]	25 [89.3%]	10 [62.5%]
	4 always	8 [12.0%]	2 [8.0%]	1 [3.6%]	5 [31.3%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
7. When you give an IV antibiotic do you refer to any of the following for guidance? [multiple answers possible]	1 pharmacist	22 [31.9%]	8 [32.0%]	5 [17.9%]	9 [56.3%]
	2 policy file	27 [39.1%]	8 [32.0%]	11 [39.3%]	8 [50.0%]
	3 ICU 'buddy'	31 [44.9%]	9 [36.0%]	11 [39.3%]	11 [68.8%]
	4 MIMS	19 [27.5%]	7 [28.0%]	3 [10.7%]	9 [56.3%]
	5 SAMF	10 [14.5%]	6 [24.0%]	3 [10.7%]	1 [6.3%]
	6 Package insert	47 [68.1%]	17 [68.0%]	18 [64.3%]	12 [75.0%]
	7 Doctor	41 [59.4%]	15 [60.0%]	17 [60.7%]	9 [56.3%]
	8 ICU shift leader	38 [55.1%]	8 [32.0%]	18 [64.3%]	12 [75.0%]
	9 ICU unit manager	23 [33.3%]	6 [24.0%]	15 [53.6%]	2 [12.5%]
	10 other	3 [4.3%]	1[4.0%]	2 [7.1%]	0 [0.0%]
	No response	1 [1.4%]	1[4.0%]	0 [0.0%]	0 [0.0%]
8. How often do you need advice with giving an IV antibiotic?	1 often	14 [20.3%]	3 [12.0%]	5 [17.9%]	6 [37.5%]
	2 not often	15 [21.7%]	5 [20.0%]	7 [25.0%]	3 [18.8%]
	3 never	4 [5.8%]	1[4.0%]	1 [3.6%]	2 [12.5%]
	4 sometimes	36 [52.2%]	16 [64.0%]	15 [53.6%]	5 [31.3%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
9. Where is the hospital IV antibiotic policy kept? [multiple answers possible]	1 there isn't one	6 [8.7%]	4 [16.0%]	2 [7.1%]	0 [0.0%]
	2 in the duty room	39 [56.5%]	15 [60.0%]	10 [35.7%]	14 [87.5%]
	3 in the patient's file	14 [20.3%]	3 [12.0%]	8 [28.6%]	3 [18.8%]
	4 on the medication trolley	2 [2.9%]	2 [8.0%]	0 [0%]	0 [0.0%]
	5 other	14 [20.3%]	2 [8.0%]	11 [39.3%]	1 [6.3%]
	No response	5 [7.2%]	2 [8.0%]	2 [7.1%]	1 [6.3%]
10. Do you find the hospital IV antibiotic policy useful?	1 no	3 [4.3%]	1 [4.0%]	0 [0.0%]	2 [12.5%]
	2 yes	44 [63.8%]	19 [76.0%]	14 [50.0%]	11 [68.8%]
	3 sometimes	10 [14.5%]	0 [0.0%]	7 [25.0%]	3 [18.8%]
	4 I have never seen this policy	9 [13.0%]	5 [20.0%]	4 [14.3%]	0 [0.0%]
	No response	3 [4.3%]	0 [0.0%]	3 [10.7%]	0 [0.0%]
11. Did you have teaching on antimicrobial stewardship during your nursing training?	1 yes	31 [44.9%]	6 [24.0%]	14 [50.0%]	11 [68.8%]
	2 I can't remember	11 [15.9%]	3 [12.0%]	7 [25.0%]	1 [6.3%]
	3 sometimes	3 [4.3%]	0 [0.0%]	3 [10.7%]	0 [0.0%]
	4 no	24 [34.8%]	16 [64.0%]	4 [14.3%]	4 [25.0%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
12. Have you had antimicrobial stewardship training since you qualified?	1 yes	32 [46.4%]	6 [24.0%]	14 [50.0%]	12 [75.0%]
	2 no	31 [44.9%]	16 [64.0%]	11 [39.3%]	4 [25.0%]
	3 not sure	6 [8.7%]	3 [12.0%]	3 [10.7%]	0 [0.0%]
	4 frequently	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
13. How often do you have antimicrobial stewardship training?	1 once a year	23 [33.3%]	2 [8.0%]	10 [35.7%]	11 [68.8%]
	2 once a month	9 [13.0%]	2 [8.0%]	5 [17.9%]	2 [12.5%]
	3 once a week	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	4 once a day	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	5 never	34 [49.3%]	20 [80.0%]	11 [39.3%]	3[18.8%]
	No response	3 [4.3%]	1[4.0%]	2 [7.1%]	0 [0.0%]
14. Who gives you the antimicrobial stewardship training? [multiple answers possible]	1 clinical facilitator	20 [29.0%]	1[4.0%]	10 [35.7%]	9 [56.3%]
	2 ICU unit manager	31 [44.9%]	4 [16.0%]	25 [89.3%]	2 [12.5%]
	3 shift leader	12 [17.4%]	1[4.0%]	3 [10.7%]	8 [50.0%]
	4 IPC nurse	15 [21.7%]	8 [32.0%]	2 [7.1%]	5 [31.3%]
	No response	22 [31.9%]	13 [52.0%]	8 [28.6%]	1[6.3%]
	1 microbiologist	8 [11.6%]	3 [12.0%]	3 [10.7%]	2 [12.5%]

15. Do you get antimicrobial stewardship training from any of the people listed below? [multiple answers possible]	2 pharmacist	19 [27.5%]	5 [20.0%]	8 [28.6%]	6 [37.5%]
	3 doctors	23 [33.3%]	14 [56.0%]	7 [25.0%]	2 [12.5%]
	4 other	11 [15.9%]	6 [24.0%]	4 [14.3%]	1 [6.3%]
	No response	8 [11.6%]	3 [12.0%]	4 [14.3%]	1 [6.3%]
16. Where do you have this antimicrobial stewardship training? [multiple answers possible]	1 at the bedside	26 [37.7%]	9 [36.0%]	8 [28.6%]	9 [56.3%]
	2 in the duty room	19 [27.5%]	8 [32.0%]	3 [10.7%]	8 [50.0%]
	3 in the training room	8 [11.6%]	1[4.0%]	6 [21.4%]	1 [6.3%]
	4 I am sent to congresses	4 [5.8%]	3 [12.0%]	1 [3.6%]	0 [0.0%]
	5 other	6 [8.7%]	4 [16.0%]	2 [7.1%]	0 [0.0%]
	No response	15 [21.7%]	5 [20.0%]	8 [28.6%]	2 [12.5%]
17. Have you had training on IV administration of antibiotic medications in this hospital? [multiple answers possible]	1 yes	30 [43.5%]	11 [44.0%]	10 [35.7%]	9 [56.3%]
	2 in-service	21 [30.4%]	5 [20.0%]	8 [28.6%]	8 [50.0%]
	3 on induction	10 [14.5%]	3 [12.0%]	7 [25.0%]	0 [0.0%]
	4 no	17 [24.6%]	11 [44.0%]	4 [14.3%]	2 [12.5%]
	No response	2 [2.9%]	0 [0.0%]	1 [3.6%]	1 [6.3%]
18. Who gives you this training? [multiple answers possible]	1 drug rep	11 [15.9%]	2 [8.0%]	0 [0.0%]	9 [56.3%]
	2 doctor	17 [24.6%]	12 [48.0%]	2 [7.1%]	3 [18.8%]
	3 shift leader	11 [15.9%]	4 [16.0%]	2 [7.1%]	5 [31.3%]
	4 clinical facilitator	24 [34.8%]	2 [8.0%]	19 [67.9%]	3 [18.8%]
	5 other	12 [17.4%]	9 [36.0%]	3 [10.7%]	0 [0.0%]
	No response	10 [14.5%]	4 [16.0%]	3 [10.7%]	3 [18.8%]
19. Who instructs you on what size (volume) infusion bag to mix the antibiotic in? [multiple answers possible]	1 shift leader	14 [20.3%]	5 [20.0%]	5 [17.9%]	4 [25.0%]
	2 pharmacist	18 [26.1%]	6 [24.0%]	3 [10.7%]	9 [56.3%]
	3 doctor	41 [59.4%]	22 [88.0%]	14 [50.0%]	5 [31.3%]
	4 clinical facilitator	10 [14.5%]	2 [8.0%]	7 [25.0%]	1 [6.3%]
	5 SOP	17 [24.6%]	9 [36.0%]	3 [10.7%]	5 [31.3%]
	6 other	14 [20.3%]	6 [24.0%]	4 [14.3%]	4 [25.0%]
	No response	3 [4.3%]	0 [0.0%]	2 [7.1%]	1 [6.3%]
20. How do you administer the antibiotic infusion? [multiple answers possible]	1 gravity feed giving set	9 [13.0%]	4 [16.0%]	5 [17.9%]	0 [0.0%]
	2 infusion pump	62 [89.9%]	22 [88.0%]	24 [85.7%]	16 [100%]
	3 syringe pump	22 [31.9%]	6 [24.0%]	13 [46.4%]	3 [18.8%]
	4 smart pump	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]
21. Who instructs you on which equipment to use? [multiple answers possible]	1 pharmacist	2 [2.9%]	1[4.0%]	0 [0.0%]	1 [6.3%]
	2 clinical facilitator	19 [27.5%]	1[4.0%]	12 [42.9%]	6 [37.5%]
	3 shift leader	20 [29.0%]	6 [24.0%]	7 [25.0%]	7 [43.8%]
	4 doctor	26 [37.7%]	15 [60.0%]	7 [25.0%]	4 [25.0%]
	5 SOP	16 [23.2%]	9 [36.0%]	2 [7.1%]	5 [31.3%]
	6 other	11 [15.9%]	5 [20.0%]	3 [10.7%]	3 [18.8%]
	No response	3 [4.3%]	1[4.0%]	1 [3.6%]	1 [6.3%]
22. When is the IV antibiotic administration giving set changed? [multiple answers possible]	1 when it is contaminated	13 [18.8%]	7 [28.0%]	4 [14.3%]	2 [12.5%]
	2 when the antibiotic infusion course is finished	5 [7.2%]	1[4.0%]	2 [7.1%]	2 [12.5%]
	3 when changing from gravity to infusion pump sets	1 [1.4%]	0 [0.0%]	1 [3.6%]	0 [0.0%]
	4 every 72 hours	57 [82.6%]	24 [96.0%]	24 [85.7%]	9 [56.3%]
	5 other	5 [7.2%]	0 [0.0%]	2 [7.1%]	3 [18.8%]
	No response	5 [7.2%]	1[4.0%]	1 [3.6%]	3 [18.8%]
23. Do you use the iv antibiotic infusion line to administer other medications ie Perfolgan/ KCL as well as antibiotics?	1 yes	24 [34.8%]	11 [44.0%]	9 [32.1%]	4 [25.0%]
	2 sometimes	7 [10.1%]	1 [4.0%]	4 [14.3%]	2 [12.5%]
	3 no	35 [50.7%]	12 [48.0%]	15 [53.6%]	8 [50.0%]
	4 I'm not sure	1 [1.4%]	0 [0.0%]	0 [0.0%]	1 [6.3%]
	No response	2 [2.9%]	1 [4.0%]	0 [0.0%]	1 [6.3%]
24. Do you clear the line of the other medication before giving an antibiotic infusion?	1 sometimes	6 [8.7%]	2 [8.0%]	3 [10.7%]	1 [6.3%]
	2 no	16 [23.2%]	5 [20.0%]	5 [17.9%]	6 [37.5%]
	3 under special circumstances	7 [10.1%]	3 [12.0%]	1 [3.6%]	3 [18.8%]
	4 yes	39 [56.5%]	15 [60.0%]	18 [64.3%]	6 [37.5%]
	No response	1 [1.4.0%]	0 [0.0%]	1 [3.6%]	0 [0.0%]
25. What would you like more education and training on?	1 different groups of antibiotics	42 [60.9%]	13 [52.0%]	16 [57.1%]	13 [81.3%]
	2 antifungals	16 [23.2%]	5 [20.0%]	5 [17.9%]	6 [37.5%]
	3 how to give antibiotic infusions	11 [15.9%]	2 [8.0%]	4 [14.3%]	5 [31.3%]

[multiple answers possible]	4 antimicrobial resistance	45 [65.2%]	19 [76.0%]	17 [60.7%]	9 [56.3%]
	5 other	3 [4.3%]	1 [4.0%]	1 [3.6%]	1 [6.3%]
	No response	0 [0.0%]	0 [0.0%]	0 [0.0%]	0 [0.0%]