Author contributions

AL and RM conceived the study and designed the trial. AL supervised the conduct of the trial and data collection. AL undertook recruitment of organizations and managed the data, including quality control. KN and RM provided statistical advice on study design and analyzed the data; KN chaired the data oversight committee. KN and AL drafted the manuscript, and all authors contributed substantially to its revision. KN and AL takes responsibility for the paper as a whole.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2018.09.040.

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Should we believe emergency department patients self-reported tetanus vaccine status?

Immunization surveying is the milestone in prevention of diseases and screening for populations at risk yet its reliability needs to be

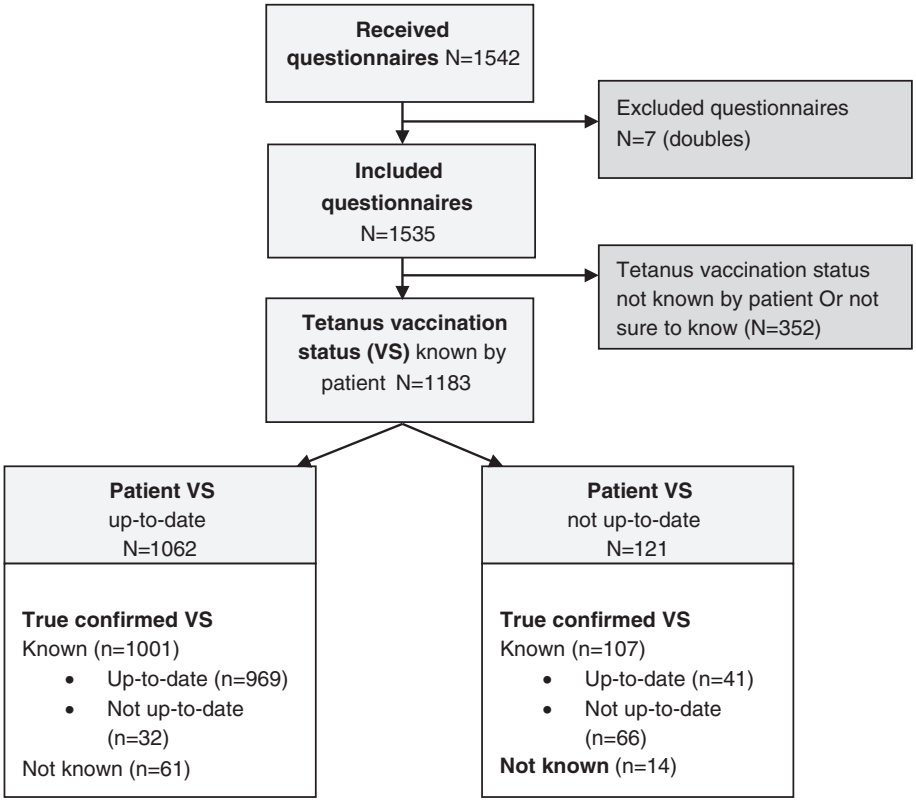

Fig. 1. Flow of our study's tetanus surveying of emergency department patients.

confirmed [1]. No study has assessed the reliability of ED patients' self-reported immunization status for tetanus. The reliability of self-reported immunization status for tetanus in ED has only been assessed by performing a rapid bed-side tetanus antibody testing. The lack of description for surveying methodology or reliability could not confer conclusive results [2-5]. We conducted this multicenter, prospective study to assess the agreement between self-reported tetanus immunization status and true recorded status (Fig. 1). This was aimed to provide answers to the followings.

- Whether ED patients were capable of truly reporting their immunization status?
- Whether the validity varied by socio-demographic [6] and tetanus risk factors?

There was a difference in % of self-reported coverage between unemployed patients compared with other socio-economic classes ($p = 0.013$), yet they were as equally vaccinated (Table 1). Manual workers (farmers, small business employers, blue-collar workers) and non-manual workers (executives, managers, white-collar workers) and students knew their coverage status consistent with other socio-economic classes ($p > 0.05$). This was inconsistent with the literature [2,3]. This can be explained by the difference in study design and methodology.

Under- and over-reporting of vaccination coverage have been suggested to be correlated with some socio-demographic factors [4]. We did not assess ethnic origins and income levels however, unemployed and small business owners under-reported their tetanus coverage (Table 5). We believe that latter socio-economic strata of ED patients could be regarded as low-risk for tetanus.

Some of our results (Tables 2-1, 2-2) were consistent with those by Talan et al. [5]. The immunization rate was lower in the elderly (72.7 in ≥70 yo vs. 89.9 in 18–69 yo vs. 95.8 in <18 yo), the unemployed (84.6%), the retired (74.5%). No significant difference was observed between the manual profession (92.9%) and intellectual profession (92.6%). According to our results, the younger and active population (students and working) strata have better tetanus immunization coverage (Table 4). Yet the younger over-reported and the unemployed under-reported their immunization coverage (Table 5) thus could be regarded as high-risk and low-risk ED patients for tetanus, respectively.

Patients self-reported not to be up-to-date, were truly not up-to-date in 61.7% (Table 3). This was consistent with 57.6% truly not up-to-date reported by Talan et al. [5]. Those who self-reported to be up-to-date were truly up-to-date in 96.8%.

Reliability of self-reported vaccination coverage has been reported to be controversial across studies [7-10] most likely due to unsuitable methodology (e.g. not designed for self-reported coverage) and reliability tests (e.g. bedside rapid antibody tests).

Given our good agreement and excellent sensitivity results (Tables 3, 4), this report can be used as a guide to tetanus vaccination practices and follow-up for health care providers. The unemployed, small business owners, the elderly could be regarded as low-risk ED patients for tetanus. The younger than 69 yo could be regarded as high-risk. Moreover, for these strata of ED population, clinicians should take into account the wound severity to decide on administration of tetanus prophylaxis. In the presence of tetanus-prone wound and given the absence of tetanus toxoid or immunoglobulin related adverse side effects clinicians should not

Table 1
ED patient's self-reported knowledge of tetanus immunization according to patients characteristics and socio-demographic.**

		Overall ($N = 1535$)	Self-reported to not know tetanus vaccine status ($N = 352$)	Self-reported to know tetanus vaccine status ($N = 1183$)	p*
Sex	Missing	6 (0.4%)	1 (0.3%)	5 (0.4%)	0.404
	Homme	670 (43.8%)	147 (41.9%)	523 (44.4%)	
	Femme	859 (56.2%)	204 (58.1%)	655 (55.6%)	
Age (years old)	N (N missing)	1522 (13 missing)	350 (2 missing)	1172 (11 missing)	
	Mean ± SD	31.79 ± 24.68	38.74 ± 24.56	29.72 ± 24.34	<0.001
	Median (q1; q3)	28.0 (10.0;50.0)	36.1 (21.0;56.8)	24.3 (8.1;48.0)	
	Min;max	0;99	0;99	0;92	
Age rankings	Missing	13 (0.8%)	2 (0.6%)	11 (0.9%)	<0.001
	<18 yo	581 (38.2%)	70 (20.0%)	511 (43.6%)	
	18–69 yo	807 (53.0%)	236 (67.4%)	571 (48.7%)	
	≥70 yo	134 (8.8%)	44 (12.6%)	90 (7.7%)	
Adult (age > 18 yo)	Missing	13 (0.8%)	2 (0.6%)	11 (0.9%)	<0.001
	No	581 (38.2%)	70 (20.0%)	511 (43.6%)	
	Yes	941 (61.8%)	280 (80.0%)	661 (56.4%)	
Seniors (age ≥ 70 yo)	Missing	13 (0.8%)	2 (0.6%)	11 (0.9%)	0.005
	Yes	134 (8.8%)	44 (12.6%)	90 (7.7%)	
	No	1388 (91.2%)	306 (87.4%)	1082 (92.3%)	
Unemployed	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.013
	No	776 (93.6%)	226 (90.4%)	550 (95.0%)	
	Yes	53 (6.4%)	24 (9.6%)	29 (5.0%)	
Farmers	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.165
	No	814 (98.2%)	243 (97.2%)	571 (98.6%)	
	Yes	15 (1.8%)	7 (2.8%)	8 (1.4%)	
Small business employers	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.332
	No	809 (97.6%)	242 (96.8%)	567 (97.9%)	
	Yes	20 (2.4%)	8 (3.2%)	12 (2.1%)	
Executives	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.852
	No	801 (96.6%)	242 (96.8%)	559 (96.5%)	
	Yes	28 (3.4%)	8 (3.2%)	20 (3.5%)	
Managers	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.843
	No	765 (92.3%)	230 (92.0%)	535 (92.4%)	
	Yes	64 (7.7%)	20 (8.0%)	44 (7.6%)	
White-collar workers	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.068
	No	629 (75.9%)	200 (80.0%)	429 (74.1%)	
	Yes	200 (24.1%)	50 (20.0%)	150 (25.9%)	
Blue-collar workers	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.886
	No	644 (77.7%)	195 (78.0%)	449 (77.5%)	
	Yes	185 (22.3%)	55 (22.0%)	130 (22.5%)	
Retired	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.653
	No	598 (72.1%)	183 (73.2%)	415 (71.7%)	
	Yes	231 (27.9%)	67 (26.8%)	164 (28.3%)	
Students	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.685
	No	796 (96.0%)	239 (95.6%)	557 (96.2%)	
	Yes	33 (4.0%)	11 (4.4%)	22 (3.8%)	
Manual profession (Farmers, small business employers, blue-collar workers)	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.531
	No	609 (73.5%)	180 (72.0%)	429 (74.1%)	
	Yes	220 (26.5%)	70 (28.0%)	150 (25.9%)	
Intellectual profession (executives, managers, white-collar workers)	Missing	112 (11.9%)	30 (10.7%)	82 (12.4%)	0.111
	No	537 (64.8%)	172 (68.8%)	365 (63.0%)	
	Yes	292 (35.2%)	78 (31.2%)	214 (37.0%)	
Place of birth other than France	No	1503 (97.9%)	344 (97.7%)	1159 (98.0%)	0.779
	Yes	32 (2.1%)	8 (2.3%)	24 (2.0%)	
Immunocompromized status	No	1507 (98.2%)	346 (98.3%)	1161 (98.1%)	0.849
	Yes	28 (1.8%)	6 (1.7%)	22 (1.9%)	
At risk for tetanus	No	1492 (97.2%)	344 (97.7%)	1148 (97.0%)	0.494
	Yes	43 (2.8%)	8 (2.3%)	35 (3.0%)	

* Student *t*-test for quantitative variables; Chi square or Fisher exact-test for qualitative variables.
** Sociodemographics included only adults and excluded pediatric population.

hesitate to administrate the suitable prophylaxis (e.g. in the low-risk strata).

One strength of our study was its population representing a wide range of ED patient strata (e.g. various age groups, diver socioeconomic strata, all comer medical and traumatic indications), in comparison with other reports (i.e. included either adult or pediatric population) [3,11-14].

Our ED survey of tetanus coverage is the most recent one in France and the last one before 2013 up-date of the tetanus coverage guidelines (i.e. vaccination reminder injection time interval was prolonged from 10 to 20 years in <65 y.o [15].

Our results were most likely overestimated due to high rate (38%) of children (i.e. better immunization coverage than adults). Our study's population mean age was much younger (31.8 yo vs.

Table 2-1
Self-reported tetanus immunization according to patients characteristics and socio-demographics.**

			Self-reported status		
		Overall (N = 1183)	Not up-to-date (*N* = 121)	Up-to-date (*N* = 1062)	p*
Sex	Missing	5 (0.4%)	0 (0.0%)	5 (0.5%)	0.660
	Men	523 (44.4%)	56 (46.3%)	467 (44.2%)	
	Women	655 (55.6%)	65 (53.7%)	590 (55.8%)	
Age (years old)	N (N missing)	1172 (11 missing)	120 (1 missing)	1052 (10 missing)	
	Mean ± SD	29.72 ± 24.34	52.79 ± 24.05	27.09 ± 22.96	<0.001
	Median (q1;q3)	24.3 (8.1;48.0)	55.9 (38.1;70.6)	20.4 (7.0;43.5)	
	Min; max	0;92	0;92	0;91	
Age rankings	Missing	11 (0.9%)	1 (0.8%)	10 (0.9%)	<0.001
	<18 yo	511 (43.6%)	12 (10.0%)	499 (47.4%)	
	18–69 yo	571 (48.7%)	77 (64.2%)	494 (47.0%)	
	≥70 yo	90 (7.7%)	31 (25.8%)	59 (5.6%)	
Adult (age > 18 yo)	Missing	11 (0.9%)	1 (0.8%)	10 (0.9%)	<0.001
	No	511 (43.6%)	12 (10.0%)	499 (47.4%)	
	Yes	661 (56.4%)	108 (90.0%)	553 (52.6%)	
Seniors (age ≥ 70 yo)	Missing	11 (0.9%)	1 (0.8%)	10 (0.9%)	<0.001
	Yes	90 (7.7%)	31 (25.8%)	59 (5.6%)	
	No	1082 (92.3%)	89 (74.2%)	993 (94.4%)	
Unemployed	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.127
	No	550 (95.0%)	90 (91.8%)	460 (95.6%)	
	Yes	29 (5.0%)	8 (8.2%)	21 (4.4%)	
Farmers	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.363
	No	571 (98.6%)	98 (100.0%)	473 (98.3%)	
	Yes	8 (1.4%)	0 (0.0%)	8 (1.7%)	
Small business employers	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.001
	No	567 (97.9%)	91 (92.9%)	476 (99.0%)	
	Yes	12 (2.1%)	7 (7.1%)	5 (1.0%)	
Executives	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.224
	No	559 (96.5%)	97 (99.0%)	462 (96.0%)	
	Yes	20 (3.5%)	1 (1.0%)	19 (4.0%)	
Managers	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.023
	No	535 (92.4%)	96 (98.0%)	439 (91.3%)	
	Yes	44 (7.6%)	2 (2.0%)	42 (8.7%)	
White-collar workers	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.004
	No	429 (74.1%)	84 (85.7%)	345 (71.7%)	
	Yes	150 (25.9%)	14 (14.3%)	136 (28.3%)	
Blue-collar workers	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.008
	No	449 (77.5%)	86 (87.8%)	363 (75.5%)	
	Yes	130 (22.5%)	12 (12.2%)	118 (24.5%)	
Retired	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	<0.001
	No	415 (71.7%)	44 (44.9%)	371 (77.1%)	
	Yes	164 (28.3%)	54 (55.1%)	110 (22.9%)	
Students	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.036
	No	557 (96.2%)	98 (100.0%)	459 (95.4%)	
	Yes	22 (3.8%)	0 (0.0%)	22 (4.6%)	
Manual profession (farmers, small business employers, blue-collar workers)	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	0.106
	No	429 (74.1%)	79 (80.6%)	350 (72.8%)	
	Yes	150 (25.9%)	19 (19.4%)	131 (27.2%)	
Intellectual profession (executives, managers, white-collar workers)	Missing	82 (12.4%)	10 (9.3%)	72 (13.0%)	<0.001
	No	365 (63.0%)	81 (82.7%)	284 (59.0%)	
	Yes	214 (37.0%)	17 (17.3%)	197 (41.0%)	
Place of birth other than France	No	1159 (98.0%)	118 (97.5%)	1041 (98.0%)	0.729
	Yes	24 (2.0%)	3 (2.5%)	21 (2.0%)	
Immunocompromized status	No	1161 (98.1%)	117 (96.7%)	1044 (98.3%)	0.272
	Yes	22 (1.9%)	4 (3.3%)	18 (1.7%)	
At risk for tetanus	No	1148 (97.0%)	114 (94.2%)	1034 (97.4%)	0.080
	Yes	35 (3.0%)	7 (5.8%)	28 (2.6%)	

* Student t-test for quantitative variables; Chi square or Fisher exact-test for qualitative variables.
** Socio-demographics included only adults and excluded pediatric population.

40 yo) than that of French 2012 census [16]. This age discrepancy can also be explained by the fact that we excluded patients not capable of reporting or recalling past events, i.e. mostly the elderly with cognitive disorders. In addition, the imbalance of our sample size across socio-economic strata must have limited the power of some analysis (Tables 2-1, 2-2).

This study puts into light the use of patient surveying (i.e. more time consuming at the least cost) instead of current substantiating tetanus antibody tests with low clinical evidence.

An ED patient self-reporting to be up-to-date is truly in 96.8% of the cases and 95.9% of the patients truly up-to-date, are reliable when self-reporting their tetanus vaccine status. Healthcare providers should

Table 2-2
Confirmed tetanus immunization according to patients characteristics and socio-demographics.[**]*, **

			Checked vaccination status		
		Overall ($N = 1108$)	Not up-to-date ($N = 98$)	Up-to-date ($N = 1010$)	p*
Sex	Missing	3 (0.3%)	0 (0.0%)	3 (0.3%)	0.497
	Men	494 (44.7%)	47 (48.0%)	447 (44.4%)	
	Women	611 (55.3%)	51 (52.0%)	560 (55.6%)	
Age (years old)	N (N missing)	1101 (7 missing)	98 (0 missing)	1003 (7 missing)	
	Mean ± SD	30.05 ± 24.63	48.53 ± 26.66	28.24 ± 23.67	<0.001
	Median (q1;q3)	25.0 (7.8;48.8)	52.9 (32.3;69.3)	23.0 (7.0;45.3)	
	Min;max	0;92	1;90	0;92	
Age rankings	Missing	7 (0.6%)	0 (0.0%)	7 (0.7%)	<0.001
	<18 yo	476 (43.2%)	20 (20.4%)	456 (45.5%)	
	18–69 yo	537 (48.8%)	54 (55.1%)	483 (48.2%)	
	≥70 yo	88 (8.0%)	24 (24.5%)	64 (6.4%)	
Adult (age > 18 yo)	Missing	7 (0.6%)	0 (0.0%)	7 (0.7%)	<0.001
	No	476 (43.2%)	20 (20.4%)	456 (45.5%)	
	Yes	625 (56.8%)	78 (79.6%)	547 (54.5%)	
Seniors (age ≥ 70 yo)	Missing	7 (0.6%)	0 (0.0%)	7 (0.7%)	<0.001
	Yes	88 (8.0%)	24 (24.5%)	64 (6.4%)	
	No	1013 (92.0%)	74 (75.5%)	939 (93.6%)	
Unemployed	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.559
	No	525 (95.3%)	66 (94.3%)	459 (95.4%)	
	Yes	26 (4.7%)	4 (5.7%)	22 (4.6%)	
Farmers	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.605
	No	543 (98.5%)	70 (100.0%)	473 (98.3%)	
	Yes	8 (1.5%)	0 (0.0%)	8 (1.7%)	
Small business employers	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.153
	No	540 (98.0%)	67 (95.7%)	473 (98.3%)	
	Yes	11 (2.0%)	3 (4.3%)	8 (1.7%)	
Executives	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.094
	No	531 (96.4%)	70 (100.0%)	461 (95.8%)	
	Yes	20 (3.6%)	0 (0.0%)	20 (4.2%)	
Managers	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.090
	No	507 (92.0%)	68 (97.1%)	439 (91.3%)	
	Yes	44 (8.0%)	2 (2.9%)	42 (8.7%)	
White-collar workers	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.170
	No	412 (74.8%)	57 (81.4%)	355 (73.8%)	
	Yes	139 (25.2%)	13 (18.6%)	126 (26.2%)	
Blue-collar workers	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.008
	No	428 (77.7%)	63 (90.0%)	365 (75.9%)	
	Yes	123 (22.3%)	7 (10.0%)	116 (24.1%)	
Retired	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	<0.001
	No	390 (70.8%)	29 (41.4%)	361 (75.1%)	
	Yes	161 (29.2%)	41 (58.6%)	120 (24.9%)	
Students	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.152
	No	532 (96.6%)	70 (100.0%)	462 (96.0%)	
	Yes	19 (3.4%)	0 (0.0%)	19 (4.0%)	
Manual profession (farmers, small business employers, blue-collar workers)	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.019
	No	409 (74.2%)	60 (85.7%)	349 (72.6%)	
	Yes	142 (25.8%)	10 (14.3%)	132 (27.4%)	
Intellectual profession (executives, managers, white-collar workers)	Missing	74 (11.8%)	8 (10.3%)	66 (12.1%)	0.004
	No	348 (63.2%)	55 (78.6%)	293 (60.9%)	
	Yes	203 (36.8%)	15 (21.4%)	188 (39.1%)	
Place of birth other than France	No	1087 (98.1%)	97 (99.0%)	990 (98.0%)	1.000
	Yes	21 (1.9%)	1 (1.0%)	20 (2.0%)	
Immunocompromized status	No	1086 (98.0%)	94 (95.9%)	992 (98.2%)	0.122
	Yes	22 (2.0%)	4 (4.1%)	18 (1.8%)	
At risk for tetanus	No	1073 (96.8%)	90 (91.8%)	983 (97.3%)	0.009
	Yes	35 (3.2%)	8 (8.2%)	27 (2.7%)	

* Student *t* test for quantitative variables; Chi square or Fisher exact-test for qualitative variables.
** Socio-demographics included only adults and excluded pediatric population.

Table 3
Agreement (overall) between self-reported patient status of tetanus immunization and checked vaccination status

		Checked vaccination status		Total
		Up-to-date	Not up-to-date	
Self report to know vaccination status	Up-to-date	969 (96.8%)	32 (3.2%)	1001
	Not up-to-date	41 (38.3%)	66 (61.7%)	107
Total		1010	98	1108
Mc Nemar test – *p*-value		0.349		
Cohen Kappa (CI95%)		0.61 (0.53; 0.69)		
Sensitivity (CI95%)		95.9 (94.5; 97.1)		
Specificity (CI95%)		67.3 (57.1; 76.5)		
PPV (CI95%)		96.8 (95.5; 97.8)		
NPV (CI95%)		61.7 (51.8; 70.9)		

Table 4
Agreement between self-reported patient status of tetanus immunization and checked vaccination status according to patient characteristics and socio-demographics

Strats variables	p-value from Mc Nemar test	Kappa (CI95%)	Sensitivity (CI95%)	Specificity (CI95%)	PPV (CI95%)	NPV (CI95%)
Sex						
Men ($n = 611$)	0.430	0.59 (0.48;0.71)	95.9 (93.9;97.4)	66.7 (52.1;79.2)	96.9 (95.1;98.2)	59.7 (45.8;72.4)
Women ($n = 494$)	0.728	0.62 (0.50;0.74)	96.0 (93.7;97.6)	68.1 (52.9;80.9)	96.6 (94.5;98.1)	64.0 (49.2;77.1)
Age						
<18 yo ($n = 476$)	0.052	0.04 (0.00;0.17)	98.3 (96.6;99.2)	5.0 (0.1;24.9)	95.9 (93.7;97.5)	11.1 (0.3;48.3)
18–69 yo ($n = 537$)	0.017	0.68 (0.58;0.78)	94.8 (92.5;96.6)	81.5 (68.6;90.8)	97.9 (96.1;99.0)	63.8 (51.3;75.0)
≥ 70 yo ($n = 88$)	0.227	0.70 (0.54;0.87)	87.5 (76.9;94.5)	87.5 (67.6;97.3)	94.9 (85.9;98.9)	72.4 (52.8;87.3)
Unemployed						
No ($n = 525$)	0.008	0.71 (0.62;0.80)	94.1 (91.6;96.1)	84.9 (73.9;92.5)	97.7 (95.9;98.9)	67.5 (56.3;77.4)
Yes ($n = 26$)	0.625	0.51 (0.10;0.92)	86.4 (65.1;97.1)	75.0 (19.4;99.4)	95.0 (75.1;99.9)	50.0 (11.8;88.2)
Farmers						
No ($n = 543$)	0.004	0.70 (0.61;0.78)	93.7 (91.1;95.7)	84.3 (73.6;91.9)	97.6 (95.7;98.8)	66.3 (55.5;76.0)
Yes (n = 8)	NA	NA	100.0 (63.1;100.0)	NA	100.0 (63.1;100.0)	NA
Small business employers						
No ($n = 540$)	0.014	0.71 (0.62;0.79)	94.3 (91.8;96.2)	83.6 (72.5;91.5)	97.6 (95.7;98.8)	67.5 (56.3;77.4)
Yes (n = 11)	0.250	0.48 (0.05;0.91)	62.5 (24.5;91.5)	100.0 (29.2;100.0)	100.0 (47.8;100.0)	50.0 (11.8;88.2)
Executives						
No ($n = 531$)	0.006	0.70 (0.32;0.79)	93.7 (91.1;95.8)	84.3 (73.6;91.9)	97.5 (95.6;98.8)	67.1 (53.2;76.7)
Yes ($n = 20$)	NA	NA	95.0 (75.1;99.9)	NA	100.0 (82.3;100.0)	100.0 (2.5;100.0)
Managers						
No ($n = 507$)	0.004	0.69 (0.60;0.78)	93.2 (90.4;95.3)	93.8 (72.9;91.6)	97.4 (95.4;98.7)	65.5 (54.6;75.4)
Yes ($n = 44$)	NA	1.00 (1.00;1.00)	100.0 (91.6;100.0)	100.0 (15.8;100.0)	100.0 (91.6;100.0)	100.0 (15.8;100.0)
White-collar workers						
No ($n = 329$)	0.001	0.71 (0.61;0.80)	92.7 (89.5;95.2)	87.7 (76.3;94.9)	97.9 (95.8;99.2)	65.8 (54.0;76.3)
Yes ($n = 139$)	1.000	0.66 (0.44;0.88)	96.8 (92.1;99.1)	69.2 (38.6;90.9)	96.8 (92.1;99.1)	69.2 (38.6;90.9)
Blue-collar workers						
No ($n = 428$)	0.005	0.72 (0.64;0.81)	93.2 (90.1;95.5)	87.3 (76.5;94.4)	97.7 (95.5;99.0)	68.8 (57.4;78.7)
Yes ($n = 123$)	0.727	0.47 (0.15;0.78)	95.7 (90.2;98.6)	57.1 (18.4;90.1)	97.4 (92.5;99.5)	44.4 (13.7;78.8)
Retired						
No ($n = 390$)	0.152	0.60 (0.46;0.75)	95.6 (92.9;97.5)	72.4 (52.8;87.3)	97.7 (95.6;99.0)	56.8 (39.5;72.9)
Yes ($n = 161$)	0.013	0.74 (0.63;0.86)	88.3 (81.2;93.5)	92.7 (80.1;98.5)	97.3 (92.2;99.4)	73.1 (59.0;84.4)
Students						
No ($n = 532$)	0.004	0.70 (0.61;0.78)	93.5 (90.9;95.6)	84.3 (73.6;91.9)	97.5 (95.6;98.8)	66.3 (55.5;76.0)
Yes ($n = 19$)	NA	NA	100.0 (82.4;100.0)	NA	100.0 (82.4;100.0)	NA
Manual profession						
No ($n = 409$)	0.016	0.73 (0.64;0.82)	93.7 (90.6;96.0)	86.7 (75.4;94.1)	97.6 (95.4;99.0)	70.3 (58.5;80.3)
Yes ($n = 142$)	0.226	0.52 (0.27;0.77)	93.9 (88.4;97.4)	70.0 (34.8;93.3)	97.6 (93.3;99.5)	46.7 (21.3;73.4)
Intellectual profession						
No ($n = 348$)	0.002	0.70 (0.60;0.79)	91.5 (87.7;94.4)	87.3 (75.5;94.7)	97.5 (94.8;99.0)	65.8 (53.7;76.5)
Yes ($n = 203$)	1.000	0.69 (0.49;0.88)	97.3 (93.9;99.1)	73.3 (44.9;92.2)	97.8 (94.6;99.4)	58.8 (41.3;89.0)
Ethnic origin						
No ($n = 1087$)	0.349	0.60 (0.52;0.69)	95.9 (94.4;97.0)	67.0 (56.7;76.2)	96.7 (95.4;97.8)	61.3 (51.4;70.6)
Yes ($n = 21$)	NC	NC	100.0 (83.1;100.0)	100.0 (2.5;100.0)	100.0 (83.2;100.0)	100.0 (2.5;100.0)
At risk for tetanus						
No ($n = 1073$)	0.288	0.58 (0.50;0.67)	95.8 (94.4;97.0)	65.6 (54.8;75.3)	96.8 (95.5;97.8)	59.0 (48.7;68.7)
Yes (n = 35)	1.000	0.92 (0.75;1.00)	100.0 (87.2;100.0)	87.5 (47.4;99.7)	96.4 (81.7;99.9)	100.0 (59.0;100.0)
Immunocompromized status						
No ($n = 1086$)	0.349	0.59 (0.51;0.68)	95.9 (94.4;97.0)	66.0 (55.5;75.4)	96.7 (95.4;97.8)	60.2 (50.1;69.7)
Yes ($n = 22$)	NC	1.00 (1.00;1.00)	100.0 (81.5;100.0)	100.0 (39.8;100.0)	100.0 (81.5;100.0)	100.0 (39.8;100.0)

believe ED patients' vaccine coverage self-report of being up-to-date. This would avoid unnecessary prophylaxis vaccinations such as tetanus toxoid or tetanus immunoglobulin.

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Table 5
Descriptive results of surveying validity in three groups: under-, true- and over-reported immunization status.

		Under ($N = 41$)	True ($N = 1035$)	Over (N = 32)	p*
Sex	Missing	0 (0.0%)	3 (0.3%)	0 (0.0%)	0.965
	Men	18 (43.9%)	461 (44.7%)	15 (46.9%)	
	Women	23 (56.1%)	571 (55.3%)	17 (53.1%)	
Age (years old)	N (N missing)	41 (0 missing)	1028 (7 missing)	32 (0 missing)	
	Mean ± SD	44.86 ± 27.57	29.66 ± 24.33	23.61 ± 24.32	<0.001
	Median (q1;q3)	46.5 (23.8;66.0)	24.9 (7.8;48.1)	12.6 (3.5;41.3)	
	Min;Max	0;92	0;91	2;81	
Age rankings	Missing	0 (0.0%)	7 (0.7%)	0 (0.0%)	<0.001
	<18 yo	8 (19.5%)	449 (43.7%)	19 (59.4%)	
	18–69 yo	25 (61.0%)	502 (48.8%)	10 (31.3%)	
	≥70 yo	8 (19.5%)	77 (7.5%)	3 (9.4%)	
Adult (age > 18 yo)	Missing	0 (0.0%)	7 (0.7%)	0 (0.0%)	0.002
	No	8 (19.5%)	449 (43.7%)	19 (59.4%)	
	Yes	33 (80.5%)	579 (56.3%)	13 (40.6%)	
Seniors (age ≥ 70 yo)	Missing	0 (0.0%)	7 (0.7%)	0 (0.0%)	0.002
	Yes	8 (19.5%)	77 (7.5%)	3 (9.4%)	
	No	33 (80.5%)	951 (92.5%)	29 (90.6%)	
Unemployed**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.037
	No	27 (90.0%)	488 (95.7%)	10 (90.9%)	
	Yes	3 (10.0%)	22 (4.3%)	1 (9.1%)	
Farmers**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.537
	No	30 (100.0%)	502 (98.4%)	11 (100.0%)	
	Yes	0 (0.0%)	8 (1.6%)	0 (0.0%)	
Small business employers**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.014
	No	27 (90.0%)	502 (98.4%)	11 (100.0%)	
	Yes	3 (10.0%)	8 (1.6%)	0 (0.0%)	
Executives**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.253
	No	29 (96.7%)	491 (96.3%)	11 (100.0%)	
	Yes	1 (3.3%)	19 (3.7%)	0 (0.0%)	
Managers**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.029
	No	30 (100.0%)	466 (91.4%)	11 (100.0%)	
	Yes	0 (0.0%)	44 (8.6%)	0 (0.0%)	
White-collar workers**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.220
	No	26 (86.7%)	379 (74.3%)	7 (63.6%)	
	Yes	4 (13.3%)	131 (25.7%)	4 (36.4%)	
Blue-collar workers**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.696
	No	25 (83.3%)	395 (77.5%)	8 (72.7%)	
	Yes	5 (16.7%)	115 (22.5%)	3 (27.3%)	
Retired**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.097
	No	16 (53.3%)	366 (71.8%)	8 (72.7%)	
	Yes	14 (46.7%)	144 (28.2%)	3 (27.3%)	
Students**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.224
	No	30 (100.0%)	491 (96.3%)	11 (100.0%)	
	Yes	0 (0.0%)	19 (3.7%)	0 (0.0%)	
Manual profession (farmers, small business employers, blue-collar workers)**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.986
	No	22 (73.3%)	379 (74.3%)	8 (72.7%)	
	Yes	8 (26.7%)	131 (25.7%)	3 (27.3%)	
Intellectual profession (executives, managers, white-collar workers)**	Missing	10 (30.3%)	69 (11.9%)	2 (15.4%)	0.062
	No	25 (83.3%)	316 (62.0%)	7 (63.6%)	
	Yes	5 (16.7%)	194 (38.0%)	4 (36.4%)	
Place of birth other than France	No	41 (100.0%)	1014 (98.0%)	32 (100.0%)	0.470
	Yes	0 (0.0%)	21 (2.0%)	0 (0.0%)	
Immunocompromized status	No	41 (100.0%)	1013 (97.9%)	32 (100.0%)	0.220
	Yes	0 (0.0%)	22 (2.1%)	0 (0.0%)	
At risk for tetanus	No	41 (100.0%)	1001 (96.7%)	31 (96.9%)	0.099
	Yes	0 (0.0%)	34 (3.3%)	1 (3.1%)	

* Anova test for quantitative variables; Chi square or Fisher exact test for qualitative variables.
** Sociodemographics included only adults and excluded pediatric population.

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Issues in professionalism confronting beginning medical students during a clerkship in emergency medicine

Medical literature largely supports the concept that professionalism is learned in a latent, implicit, and experiential manner [1]. This informal curriculum is defined as the interpersonal experiences between students and their teachers, residents, and patients. It is these critical interactions, not exposures to classroom didactics, that are the more formative influence on medical students first exposed to Emergency Medicine (EM) [1,2]. Medical educators need to understand how these day-to-day experiences, modeling positive and negative behaviors, shape student perceptions of the specialty and its values. Student narrative essays provide a rich source of information about such professional issues confronted during clerkships. Routinely assigned to encourage reflection and to support the educational experience of students, narrative essays are underused as a data source for curricular reform [3]. The aim of this study was to review student narratives for insight into professionalism dilemmas and the impact they might have on beginning students adapting to the clinical world.

This was a prospective observational study of first- and second-year medical students, electing to do a clinical clerkship in EM at a single university-affiliated hospital *during a four-year study period*.

Table 1
Frequency of professionalism incidents documented in student narratives ($N = 387$).

Caring and compassion	59 (15.2%)
Sensitivity (culture, age, gender, disabilities)	43 (11.1%)
Appropriate symptomatic care	42 (10.9%)
Integrity (trustworthy, honesty)	40 (10.3%)
Leadership (effectively coordinates team)	38 (9.8%)
Respect patient's dignity and privacy	36 (9.3%)
Observable patient advocacy	35 (9.0%)
Listen to patients and respect their views	22 (5.7%)
Deal with complexity and uncertainty	19 (4.9%)
Responsive to feedback (staff, patients, families, peers)	17 (4.4%)
Confidentiality	9 (2.3%)
Discusses death honestly, compassionately	6 (1.6%)
Uses humor/language appropriately	6 (1.6%)
Managing conflicts of interest	5 (1.3%)
Responsibility/accountability	4 (1.0%)
Medical error	4 (1.0%)
Personal life interferes with work	1 (0.3%)
Appropriate dress and cleanliness	1 (0.3%)
Impaired physician	0
Sexual misconduct	0
Risk-taking	0

Elective students signed up for three 4-h shifts during which they shadowed an attending or resident physician in the Emergency Department (ED). During the study period, students were asked to write short narrative descriptions of three cases that had the greatest impact on them during the elective. The faculty, residents, and students were blinded to the study objectives. Each narrative essay was deidentified and independently analyzed by three EM investigators with different clinical and academic backgrounds. Our coding system and data abstraction for professionalism was adapted from an Association of American Medical Colleges (AAMC) report on professionalism. The main outcomes were the frequency and type of professionalism issues reported by students. After coding, professionalism incidents were reviewed in order to characterize the remarkable properties of each incident, whether it was 'negative' in the sense of violating a norm or 'positive' by exemplifying it. Descriptive statistics were used to summarize the data. A blinded critical review of a random sample of 10% of the narratives was done to determine rater reliability. The interrater reliability was moderate, with a median kappa statistic of 0.67.

During the four-year study period, 292 consecutive student essays were evaluated from 103 medical students. The mean student age was 26 ± 3 years; 55% were male. Overall, 207 of the 292 reflections (70.9%) included professionalism issues. A total of 387 specific incidents were coded across 21 categories of professionalism (Table 1). The four most common categories were incidents related to caring and compassion (15.2%); sensitivity (11.1%); appropriate use of symptomatic care (10.9%); and integrity (10.3%). The majority of incidents involved clinician interaction with patients or families (59%), followed by interprofessional incidents (41%). Overall, 282 of the 387 (72.3%) incidents were depictions of exemplary instances of professionalism, 87 (22.5%) were considered normal interactions, and 18 (4.7%) were negative interactions. The negative interactions were generally related to insensitivity to patient's pain/emotional state (5), lack of caring and compassion (4), treating patients/family and staff with disrespect (3), acknowledging mistakes (2), inappropriate use of humor (2), lack of confidentiality (1) and personal/professional balance (1). While students were impressed by their observations of EM clinicians and residents, their eyes were opened to the improper treatment of acutely ill patients, be it poor pain management, discrimination, inadequate patient education, or a perceived lack of empathy.

Medical student narrative essays showed a wide variety of interesting professional interactions. Drawn from daily experience, student essays provided insight into learning not easily measured by traditional evaluation. As others have noted, the list of real-world ethical and professional dilemmas that beginning students face every day does not