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Research Letter

Willingness to undergo antibiotic treatment of acute appendicitis based on risk of treatment failure

J. E. Rosen [1,2,*], N. Agrawal[2,3], D. R. Flum[1,2] and J. M. Liao[2,4]

[1]Surgical Outcomes Research Center, Department of Surgery, University of Washington, Seattle, Washington, USA
[2]Decision Science Group, Seattle, Washington, USA
[3]Foster School of Business, University of Washington, Seattle, Washington, USA
[4]Department of Medicine, University of Washington, Seattle, Washington, USA

*Correspondence to: Department of Surgery, University of Washington, 1959 NE Pacific Street, Box 356410, Seattle, Washington 98195, USA (e-mail: jerosen@uw.edu)

Dear Editor,

The COVID-19 pandemic has led to increased adoption of non-operative management strategies for acute appendicitis[1]. Despite mounting evidence for their efficacy and safety[2], surgeons may still hesitate to recommend antibiotics owing to concerns about high treatment failure risk and eventual appendicectomy (up to 30 per cent at 1 year)[3,4]. It is unknown how that risk, and the uncertainty around it, influences patients' appendicitis decision-making.

A survey was undertaken of American adults recruited via Amazon Mechanical Turk in April 2021. The survey described antibiotics as non-operative appendicitis treatment and the probability of treatment failure within 3 months (need for appendicectomy), framed both negatively (chance of needing surgery) and positively (chance of avoiding surgery). Respondents were randomized to 1 of 14 arms varying in how treatment failure risk was described: seven arms reported risks of 10, 15, 20, 30, 40, 50, and 60 per cent; seven analogous arms reported these point estimates with the addition of a range (+/− 4 per cent). The primary outcome was willingness to try antibiotic treatment and the secondary outcome was perceived accuracy and trust in the information provided, measured on a five-point scale[5]. American Association for Public Reporting of Opinion Research reporting guidelines were followed.

After quality checks (87 of 1429 removed) and exclusion of those who had appendicitis previously (85 of 1342 removed), the sample consisted of 1257 adults. Sociodemographic characteristics were balanced across survey arms. Few (115 of 1257, 9.1 per cent) were aware that antibiotics could be used to treat appendicitis before taking the survey. Most respondents (1045 of 1257, 83.1 per cent) were willing to try antibiotic treatment, with higher risks of treatment failure resulting in moderately lower willingness (*Table 1*). Among those who would try antibiotics, over half (599 of 1045, 57.3 per cent) were willing regardless of the risk of treatment failure, whereas, on average, the remaining respondents were willing to try until the treatment failure risk reached a mean(s.d.) of 53.6(23.0) per cent. Male sex and gender identity, increased perceived accuracy of information, and increased trust in the data were associated with willingness to try antibiotics.

The proportion of individuals willing to try antibiotics was generally higher when ranges were provided alongside the point estimate for treatment failure risks (*Table 1*). Perceived accuracy (mean(s.d.) score 3.3(1.0) *versus* 3.5(1.0); $P < 0.001$) and trust in the information (mean score 3.3(1.0) *versus* 3.5(1.0); $P = 0.001$) was also greater in arms including ranges.

Increasing evidence of the efficacy and safety of non-operative treatment for uncomplicated acute appendicitis has led to the recognition that this treatment decision is value- and preference-dependent, and must be made jointly with patients[3]. Although surgeons commonly report a threshold for risk of treatment failure that makes it too high to be worth trying[4], this study found that over 70 per cent of patients were willing to try antibiotics for even a 40 per cent chance of avoiding surgery. This suggests a disconnect between the ways clinicians and patients conceptualize risk and benefit. An additional observation is that surgeons may affect patients' perceived accuracy of and trust in treatment information by providing uncertainty information. Providing ranges increased trust and accuracy perceptions, which were in turn associated with greater willingness to try antibiotics.

Study limitations include use of a sample that may differ from patients experiencing appendicitis, and a focus on one aspect of appendicitis treatment, which the authors felt was the most likely to have a misalignment between patient and surgeon values. Nonetheless, these findings provide what is to the authors' knowledge the first evidence to date about a clinically salient dynamic—individuals' willingness to try treatments that surgeons may consider too high risk. This is a critical area for future work and strong shared decision-making between surgeons and patients.

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Table 1 Factors associated with willingness to try non-operative management of appendicitis

	Overall ($n = 1257$)	Not willing to try non-operative management ($n = 212$)	Willing to try non-operative management ($n = 1045$)	P
Risk of treatment failure (%)				0.001
10	92	10 (11)	82 (89)	
15	85	11 (13)	74 (87)	
20	86	17 (10)	69 (80)	
30	95	16 (17)	79 (83)	
40	93	20 (22)	73 (78)	
50	88	18 (20)	70 (80)	
60	92	23 (25)	69 (75)	
10 (6–14†)	89	7 (8)	82 (92)	
15 (11–19†)	94	10 (11)	84 (89)	
20 (16–24†)	88	7 (8)	81 (92)	
30 (26–34†)	85	11 (13)	74 (87)	
40 (36–44†)	93	18 (19)	75 (81)	
50 (46–54†)	87	19 (22)	68 (78)	
60 (56–64†)	90	25 (28)	65 (72)	
Age (years)*	37.37(12.38)	37.46(12.53)	37.36(12.35)	0.910
Sex				0.001
F	752	150 (19.9)	602 (80.1)	
M	501	62 (12.4)	439 (87.6)	
Prefer not to say	4	0 (0)	4 (100)	
Gender identity				0.028
Woman	735	147 (20.0)	588 (80.0)	
Man	498	63 (12.7)	435 (87.3)	
Genderqueer/gender non-conforming	11	2 (18)	9 (82)	
Trans male/trans man	5	0 (0)	5 (100)	
Prefer not to say	4	0 (0)	4 (100)	
Trans female/trans woman	2	0 (0)	2 (100)	
Different identity	2	0 (0)	2 (100)	
Racial identity				0.748
Black	125	24 (19.2)	101 (80.8)	
East Asian	75	11 (15)	64 (85)	
Multiple identities	56	12 (21)	44 (79)	
Other Specified Identity	29	7 (24)	22 (76)	
South Asian	43	7 (16)	36 (84)	
Unknown	12	1 (8)	11 (92)	
White	917	150 (16.4)	767 (83.6)	
Ethnicity				0.212
Hispanic/Latino/Latinx	105	24 (22.9)	81 (77.1)	
Non-Hispanic/Latino/Latinx	1095	181 (16.5)	914 (83.5)	
Prefer not to say	27	2 (7)	25 (93)	
Prefer to write it down	30	5 (17)	25 (83)	
Education level				0.369
Some high school	4	1 (25)	3 (75)	
High school/GED	112	14 (12.5)	98 (87.5)	
Some college	268	55 (20.5)	213 (79.5)	
2-year college degree	134	24 (17.9)	110 (82.1)	
4-year college degree	499	76 (15.2)	423 (84.8)	
Graduate degree	235	42 (17.9)	193 (82.1)	
Unknown	5	0 (0)	5 (100)	
Insurance				0.726
Employer-provided	649	111 (17.1)	538 (82.9)	
Private	179	36 (20.1)	143 (79.9)	
Other government	48	6 (12)	42 (88)	
Medicaid	131	21 (16.0)	110 (84.0)	
Medicare	96	17 (18)	79 (82)	
Not insured	124	18 (14.5)	106 (85.5)	
Other	30	3 (10)	27 (90)	
Employment status				0.881
Employed full-time (≥ 40 h/week)	661	107 (16.2)	554 (83.8)	
Employed part-time (< 40 h/week)	144	21 (14.6)	123 (85.4)	
Self-employed	124	22 (17.7)	102 (82.3)	
Retired	59	12 (20)	47 (80)	
Student	80	17 (21)	63 (79)	
Unemployed (looking for work)	97	17 (17)	80 (83)	
Unemployed (not looking for work)	80	13 (16)	67 (84)	
Prefer not to say	12	3 (25)	9 (75)	
Annual household income (euros)				0.446
< 21 076	176	27 (15.3)	149 (84.7)	
21 077–42 150	326	60 (18.4)	266 (81.6)	

(continued)

Table 1. (continued)

	Overall ($n = 1257$)	Not willing to try non-operative management ($n = 212$)	Willing to try non-operative management ($n = 1045$)	*P*
42 151–63 224	248	45 (18.1)	203 (81.9)	
63 225–84 299	203	39 (19.2)	164 (80.8)	
>84 299	262	34 (13.0)	228 (87.0)	
Prefer not to say	42	7 (17)	35 (83)	
Perceived information accuracy[*‡]	3.40(0.98)	3.01(1.10)	3.48(0.94)	< 0.001
Trust in information given[*§]	3.42(1.00)	2.87(1.09)	3.53(0.94)	< 0.001

Values in parentheses are percentages unless indicated otherwise; *values are mean(s.d.). [†]Range. [‡]Scale from 1 to 5, with 5 being highest perceived accuracy. [§]Scale from 1 to 5, with 5 being greatest trust. GED = General Educational Development Test, t-test for continuous variables and chi-squared test for categorical variables test.

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