

Covariate selection

Differences in patient experiences between groups may reflect differences in experiences of care. However, they may also reflect differences in expectations or the way various groups tend to respond to surveys. To enable fairer comparisons across hospitals, the enhanced reporting method considers which patient characteristics may be consistently associated with more positive or less positive reported experiences.

Information regarding rurality of patients and socioeconomic status (SES) were also considered as they may relate to response tendency. However, BHI chose not to include factors such as rurality or SES as these factors may reflect differences in care. Instead, analyses of results by these patient groups are presented in BHI's interactive data portal, Healthcare Observer, to allow hospitals to see which patient groups reported more or less positive experiences of care. A list of all patient characteristics considered for inclusion in the model for standardised comparisons and how they were sourced is included in Table 7.

Information on patient health status such as self-reported overall health or mental health status could also influence both experiences of care and responding tendency, but were not considered for inclusion in the model. Currently BHI only standardises comparisons for experience of care questions by adjusting patient, not clinical or health, characteristics.

For age and sex, missing values were filled in using administrative data. Following this, there was no missing data for age and sex. Missing data for other patient characteristics were included in all analyses as an extra category in the model. Missing data in performance-related questions were excluded from all analyses.

Table 7 Patient characteristics considered for adjustment

Variable	Source	Categories
Age	Survey question, or using administrative data if missing	0-17, 18-34, 35-54, 55-74, 75+
Sex	Survey question, or using administrative data if missing	Female, Male
Education level	Survey question	Completed year 12, trade/technical certificate/diploma, university degree, postgraduate degree, missing
Language mainly spoken at home	Survey question	English, other than English, missing
Stay type	Administrative data	Admitted to hospital, non-admitted to hospital upon ED departure
Online/ Paper	Administrative data	Paper, online
Proxy response	Survey question	The patient, the patient with help, other people on patient's behalf, missing
Had previous visit to ED for the same or related condition	Survey question	Yes, No, missing

Table 8 presents a list of covariates considered for adjustment by selection stage and survey. These patient characteristics were then passed through two selection stages, as follows:

1. Univariate models were fitted for each patient characteristic (covariate) for all performance-related questions in the survey. Covariates with $p < 0.1$ in the univariate models for at least 50% of the questions were considered for inclusion in the multivariate model.
2. Multivariate logistic mixed models were fitted across all performance-related questions in the survey using the covariates selected from stage one, with age and sex included in all models. Forward stepwise modelling was used based on the equation above, including age, sex and all additional covariates added appropriately following a forward stepwise approach. Selected interaction terms were also tested.

Within each outcome (i.e. performance-related survey question) the models were ranked by the

Akaike Information Criterion (AIC) – the model with the smallest AIC value was assigned the highest rank of 1. The AIC was recommended as an appropriate method for selecting models where different fixed effects are included as it applies a penalty for the number of covariates in order to protect against model overfitting.¹

The following values were obtained:

- number of questions for which the model was ranked first
- mean rank across all questions
- mean AIC value across all questions.

These values were used to identify the optimal model to create adjusted comparisons for the survey results, with each survey from the NSW Patient Survey Program assessed independently. That is, the optimal model had a high count of 1st ranking, a low mean rank, and a low mean AIC relative to other models, across all performance-related questions in the survey.

Table 8 Covariates considered for adjustment for comparisons at each selection stage by survey.

	Available for adjustment	Passed univariate model selection threshold (stage 1)	Passed multivariate model selection threshold (stage 2)	After consultation with expert panel and confirmed by sensitivity analyses
Age group	✓	✓	✓	✓
Sex	✓	✓	✓	✓
Education	✓	✓	✓	✓
Language mainly spoken at home	✓	✓	✓	✓
Online/Paper	✓	✓	✓	
Proxy response	✓	✓	✓	
Service Category	✓	✓	✓	
Had previous visit to ED for the same or related condition	✓	✓	✓	

Finally, covariates that marginally improved the model were excluded by comparing the models' AIC values, to define a parsimonious number of patient-related covariates to use in standardised comparisons. Covariates that were not part of patient characteristics (e.g. whether patients were staying overnight or had same-day admission) were not included in the testing. This is because standardised comparisons are intended to control for differences in patient characteristics only, and some of these factors were considered to be under the control of hospital management rather than patients.

Age, sex, education and language spoken were chosen for adjustment for the comparison model.

Model-based comparisons

The model calculates an estimate for each hospital's random intercept, and produces a p-value to indicate how likely these estimates are different from the average, or NSW value.

The exponential values of the estimated hospital random intercepts based on the random intercept logistic regression model can be used to estimate the odds of a positive experience (e.g. 'very good' for overall care question) for the hospital with reference to an 'average' hospital. The p-value for each hospital intercept estimate was used to determine if the hospital was significantly different from NSW, when adjusted for patient characteristics, using the following guidelines:

- If the p-value was less than the significance level (0.01) and the solution for the hospital random intercept was greater than 0, the hospital was flagged as having a more positive result than NSW.
- If the p-value was less than the significance level and the random effect solution was less than 0, the hospital was flagged as having a less positive result than NSW.
- If the p-value was greater than the significance level, the hospital was flagged grey as not significantly different to NSW.
- For results flagged as 'interpret with caution', comparisons are not highlighted due to the lack of precision in the result.

When making multiple comparisons there is an increased likelihood of flagging a difference that is not 'real', but due to chance. To mitigate this issue, a p-value of 0.01 was used to reduce the likelihood of identifying differences due to chance to one comparison in 100 (from one in 20, with the more commonly used p-value of 0.05). Sampling weights were used in all models to ensure the comparisons were representative of the NSW patient population.

Statistical software

SAS software version 9.4 was used for all statistical analyses. PROC GLIMMIX procedure was used for performing logistic mixed models.

Appendix 1

Unweighted percentage of missing and 'Don't know' responses

Table 9 Percentage of 'Don't know' and/or missing responses by question, EDPS 2018–19

Question number	Question text	Missing %	Don't know %	Missing + Don't know %*
1	What was your main form of transport to the ED?	1.7		1.7
2	Was there a problem in finding a parking place near the ED?	3.1		3.1
3	Was the signposting directing you to the ED of the hospital easy to follow?	3.5		3.5
4	Were the reception staff you met on your arrival polite and courteous?	1.4	2.1	3.5
5	Did the ED staff you met on arrival give you enough information about what to expect during your visit?	1.7	5.2	6.9
6	Did the ED staff you met on arrival tell you how long you would have to wait for treatment?	1.9	8.9	10.8
7	Was the waiting time given to you by the ED staff you met on arrival about right?	2.3	4.9	7.2
8	Did you experience any of the following issues when in the waiting area? [with seating, safety, noise, temperature or odour in the waiting area]	5.5		5.5
9	How clean was the waiting area in the ED?	1.1		1.1
10	From the time you first arrived at the ED, how long did you wait before being triaged by a nurse - that is, before an initial assessment of your condition was made?	2.4	4.7	7.2
11	Did you stay until you received treatment?	2.3		2.3
12	Why did you leave the ED before receiving treatment?	2.0	2.3	4.4
13	After triage (initial assessment), how long did you wait before being treated by an ED doctor or nurse?	3.3	5.9	9.2
14	While you were waiting to be treated, did ED staff check on your condition?	0.7	4.8	5.5
15	While you were waiting to be treated, did your symptoms or condition get worse?	0.8	4.6	5.4
16	Did the ED health professionals introduce themselves to you?	2.8	4.5	7.3
17	Did the ED health professionals explain things in a way you could understand?	3.3		3.3
18	Did you have enough time to discuss your health or medical problem with the ED doctors?	2.9	2.0	4.9
19	How much information about your condition or treatment was given to you by ED health professionals?	3.2		3.2
20	Were you involved, as much as you wanted to be, in decisions about your care and treatment?	3.1		3.1
21	If your family members or someone else close to you wanted to talk to the ED staff, did they get the opportunity to do so?	3.2	2.7	5.9
22	How much information about your condition or treatment was given to your family, carer or someone else close to you?	3.3	4.3	7.6
23	Were you able to get assistance or advice from ED staff for your personal needs (e.g. for eating, drinking, going to the toilet, contacting family)?	3.2		3.2
24	How would you rate how the ED health professionals worked together?	3.0		3.0

Question number	Question text	Missing %	Don't know %	Missing + Don't know %*
25	Did you have confidence and trust in the ED health professionals treating you?	2.9		2.9
26	Were the ED health professionals polite and courteous?	2.8		2.8
27	Overall, how would you rate the ED health professionals who treated you?	2.9		2.9
28	Did you ever receive contradictory information about your condition or treatment from ED health professionals?	3.6		3.6
29	Were the ED health professionals kind and caring towards you?	3.0		3.0
30	Did you feel you were treated with respect and dignity while you were in the ED?	3.0		3.0
31	Were you given enough privacy during your visit to the ED?	3.2		3.2
32	Were your cultural or religious beliefs respected by the ED staff?	3.7		3.7
33	Did you have worries or fears about your condition or treatment while in the ED?	3.4		3.4
34	Did an ED health professional discuss your worries or fears with you?	3.8		3.8
35	In your opinion, did the ED nurses who treated you know enough about your care and treatment?	3.9	3.2	7.1
36	Were you ever in pain while in the ED?	4.0		4.0
37	Do you think the ED health professionals did everything they could to help manage your pain?	2.9		2.9
38	Did you see ED health professionals wash their hands, or use hand gel to clean their hands, before touching you?	3.5	19.8	23.3
39	How clean was the treatment area in the ED?	3.7		3.7
40	While you were in the ED, did you feel threatened by other patients or visitors?	3.4		3.4
41	While you were in the ED, did you see or hear any aggressive or threatening behaviour towards ED staff?	3.4	3.4	6.7
42	Were there things for your child to do (such as books, games and toys)?	2.8	7.5	10.3
43	Was the area in which your child was treated suitable for someone of their age group (0-15 years)?	2.4		2.4
44	Did the ED staff provide care and understanding appropriate to the needs of your child (0-15 years)?	2.3		2.3
45	During your visit to the ED, did you have any tests, X-rays or scans?	7.8	3.1	10.9
46	Did an ED health professional discuss the purpose of these tests, X-rays or scans with you?	1.4	2.1	3.6
47	Did an ED health professional explain the test, X-ray or scan results in a way that you could understand?	2.0		2.0
48	What happened at the end of your ED visit?	5.1		5.1
49	Did you feel involved in decisions about your discharge from hospital?	1.7		1.7
50	Thinking about when you left the ED, were you given enough information about how to manage your care at home?	1.5		1.5
51	Did ED staff take your family and home situation into account when planning your discharge?	1.8	3.6	5.3

Question number	Question text	Missing %	Don't know %	Missing + Don't know %*
52	Thinking about when you left the ED, were adequate arrangements made by the hospital for any services you needed?	1.9		1.9
53	Did ED staff tell you who to contact if you were worried about your condition or treatment after you left hospital?	1.8	10.6	12.4
54	Thinking about your illness or treatment, did an ED health professional tell you about what signs or symptoms to watch out for after you went home?	2.2		2.2
55	Were you given or prescribed any new medication to take at home?	1.7		1.7
56	Did an ED health professional explain the purpose of this medication in a way you could understand?	1.5		1.5
57	Did an ED health professional tell you about medication side effects to watch for?	1.8		1.8
58	Did you feel involved in the decision to use this medication in your ongoing treatment?	2.1		2.1
59	Did an ED health professional tell you when you could resume your usual activities, such as when you could go back to work or drive a car?	2.3		2.3
60	Did the ED staff provide you with a document that summarised the care you received (e.g. a copy of the letter to your GP or a discharge summary)?	2.3	13.2	15.6
61	Was your departure from the ED delayed - that is, before leaving the ED to go to a ward, another hospital, home, or elsewhere?	5.2		5.2
62	Did a member of staff explain the reason for the delay? [in discharge]	3.2		3.2
63	What were the main reasons for the delay? [in discharge]	3.5	3.6	7.1
64	Overall, how would you rate the care you received while in the ED?	1.5		1.5
65	If asked about your experience in the ED by friends and family how would you respond?	1.8		1.8
66	Did the care and treatment received in the ED help you?	1.7		1.7
67	In total, how long did you spend in the ED? (From the time you entered the ED until the time you left the ED to go to a ward, another hospital, home, or elsewhere)	2.1	6.2	8.3
68	Did you want to make a complaint about something that happened in the ED?	2.1		2.1
69	Were you ever treated unfairly for any of the reasons below?	4.9		4.9
70	Not including the reason you came to the ED, during your visit or soon afterwards, did you experience any of the following complications or problems?	3.1		3.1
71	Was the impact of this complication or problem ...?	2.6		2.6
72	In your opinion, were members of the hospital staff open with you about this complication or problem?	2.7		2.7
73	What were your reasons for going to the ED?	1.5		1.5
74	When you visited the ED, was it for a condition that you thought could have been treated by a General Practitioner (GP)?	2.0		2.0
75	In the month before visiting the ED, did you...?	2.4	7.2	9.5
76	Before your visit to the ED, had you previously been to an ED for the same condition or something related to it?	2.3		2.3

Question number	Question text	Missing %	Don't know %	Missing + Don't know %*
77	In the past 12 months, how many times have you visited an ED for your own care?	2.4		2.4
78	What year were you born?	2.0		2.0
79	What is your gender?	1.4		1.4
80	Highest level of education completed	3.4		3.4
81	Aboriginal and/or Torres Strait Islander	2.5		2.5
82	Did you receive support, or the offer of support, from an Aboriginal Health Worker while you were in the ED?	3.6	7.9	11.4
83	Which, if any, of the following longstanding conditions do you have (including age related conditions)?	2.7		2.7
84	Does this condition(s) cause you difficulties with your day-to-day activities?	2.5		2.5
85	Are you a participant of the National Disability Insurance Scheme (NDIS)?	3.0	6.2	9.2
86	Language mainly spoken at home	1.7		1.7
87	Did you need, or would have liked, to use an interpreter at any stage while you were in the ED?	2.0		2.0
88	Did the ED provide an interpreter when you needed one?	1.1		1.1
89	In general, how would you rate your health?	1.6		1.6
90	Who completed this survey?	1.5		1.5
91	Do you give permission for the BHI to link your answers from this survey to health records related to you (the patient)?	2.2		2.2

* Percentages for this column may not equal the sum of the 'Missing %' and 'Don't know %' columns because they were calculated using unrounded figures. Percentages are unweighted

Appendix 2

Derived measures

Definition

Derived measures are those for which results are calculated indirectly from respondents' answers to a survey question. These tend to be from questions that contain a 'not applicable' type response option and are used to gather information about patients' needs.

Derived measures involve the grouping together of more than one response option to a question. The derived measure 'Quintile of Disadvantage' is an exception to this rule. For more information on this, please refer to the *Data Dictionary: Quintile of disadvantage* on BHI's website at bhi.nsw.gov.au/nsw_patient_survey_program

Statistical methods

Results are expressed as the percentage of respondents who chose a specific response option or options for a question. The reported percentage is calculated as the numerator divided by the denominator (see definitions below).

Results are weighted as described in this report.

Numerator

The number of survey respondents who selected a specific response option/s to a certain question, minus exclusions.

Denominator

The number of survey respondents who selected any of the response options to a certain question, minus exclusions.

Exclusions

For derived measures, the following are usually excluded:

- Response: 'don't know/can't remember' or similar non-committal response
- Response: invalid (i.e. respondent was meant to skip a question but did not)
- Response: missing (with the exception of questions that allow multiple responses or a 'none of these' option, to which the missing responses are combined to create a 'none reported' variable).

Interpretation of indicator

The higher the percentage, the more respondents fall into that response category.

The following questions and responses were used in the construction of the derived measures.

Table 10 Derived measures for the EDPS 2018–19 questionnaire

Derived measure	Original question	Derived measure categories	Response options
Needed parking near the ED	Q2. Was there a problem in finding a parking place near the ED?	Needed parking	Yes, a big problem
			Yes, a small problem
			No problem
		Didn't need parking	I did not need to park
Needed to wait for treatment after meeting reception staff	Q6. Did the ED staff you met on arrival tell you how long you would have to wait for treatment?	Needed to wait	Yes
			No
		Didn't need to wait	I didn't need to wait for treatment
Experienced issues with seating, safety, noise, temperature or odour in the waiting area	Q8. Did you experience any of the following issues when in the waiting area? [with seating, safety, noise, temperature or odour in the waiting area]	Spent time in waiting area	I couldn't find somewhere to sit
			The seats were uncomfortable
			I did not feel safe
			It was too noisy
			It was too hot
			It was too cold
			There were bad or unpleasant smells
			No, I did not experience these issues
			Wasn't in waiting area
		Triaged by a nurse	Q10. From the time you first arrived at the ED, how long did you wait before being triaged by a nurse - that is, before an initial assessment of your condition was made?
1-15 minutes			
16-30 minutes			
31-59 minutes			
1 hour to less than 2 hours			
2 hours or more			
Didn't see a triage nurse	I did not see a triage nurse		
Treated by a doctor	Q18. Did you have enough time to discuss your health or medical problem with the ED doctors?	Not treated by a doctor	I wasn't treated by a doctor
		Treated by a doctor	Yes, definitely
			Yes, to some extent
			No

Derived measure	Original question	Derived measure categories	Response options
Needed information about condition or treatment	Q19. How much information about your condition or treatment was given to you by ED health professionals?	Needed information	Not enough The right amount Too much
		Didn't need information	Not applicable to my situation
Wanted or were well enough to be involved in decisions about care and treatment	Q20. Were you involved, as much as you wanted to be, in decisions about your care and treatment?	Wanted involvement and was well enough	Yes, definitely Yes, to some extent No
		Not well enough or didn't want involvement	I was not well enough to be involved I did not want or need to be involved
Had family/someone close who wanted to talk to staff	Q21. If your family members or someone else close to you wanted to talk to the ED staff, did they get the opportunity to do so?	Wanted to talk to staff	Yes, definitely Yes, to some extent No, they did not get the opportunity
		Not applicable	Not applicable to my situation
Had family/someone close who wanted information about condition or treatment	Q22. How much information about your condition or treatment was given to your family, carer or someone else close to you?	Wanted information	Not enough The right amount Too much
		Not applicable	It was not necessary to provide information to any family or friends
Needed assistance or advice from ED staff for personal needs	Q23. Were you able to get assistance or advice from ED staff for your personal needs (e.g. for eating, drinking, going to the toilet, contacting family)?	Needed assistance	Yes, always Yes, sometimes No
		Didn't need assistance	I did not need assistance or advice
Had religious or cultural beliefs to consider	Q32. Were your cultural or religious beliefs respected by the ED staff?	Had beliefs to consider	Yes, always Yes, sometimes No, my beliefs were not respected
		Beliefs not an issue	My beliefs were not an issue
Received treatment from an ED nurse	Q35. In your opinion, did the ED nurses who treated you know enough about your care and treatment?	Treated by an ED nurse	Yes, always Yes, sometimes No
		Wasn't treated by an ED nurse	I wasn't treated by a nurse

Derived measure	Original question	Derived measure categories	Response options
Needed things for child to do (such as books, games and toys)	Q42. Were there things for your child to do (such as books, games and toys)?	Child needed things to do	There were plenty of things for my child to do
			There were some things, but not enough
			There was nothing for my child's age group
			There was nothing for children to do
		Not applicable	Not applicable to my child's visit
Received results of test, X-ray or scan results while in ED	Q47. Did an ED health professional explain the test, X-ray or scan results in a way that you could understand?	Told results	Yes, completely
			Yes, to some extent
			No
		Not told results in ED	I was not told the results while in the ED
Wanted or needed to be involved in decisions about discharge	Q49. Did you feel involved in decisions about your discharge from hospital?	Wanted involvement	Yes, definitely
			Yes, to some extent
			No, I did not feel involved
		Didn't want involvement	I did not want or need to be involved
Needed information on how to manage care at home	Q50. Thinking about when you left the ED, were you given enough information about how to manage your care at home?	Needed information	Yes, definitely
			Yes, to some extent
			No, I was not given enough information
		Didn't need information	I did not need this type of information
Needed family and home situation taken into account when planning discharge	Q51. Did ED staff take your family and home situation into account when planning your discharge?	Had situation to consider	Yes, definitely
			Yes, to some extent
			No, staff did not take my situation into account
		Not necessary	It was not necessary
Needed services after discharge	Q52. Thinking about when you left the ED, were adequate arrangements made by the hospital for any services you needed?	Needed services	Yes, definitely
			Yes, to some extent
			No, arrangements were not adequate
		Didn't need services	It was not necessary
Wanted or needed to be involved in decisions about medication	Q58. Did you feel involved in the decision to use this medication in your ongoing treatment?	Wanted involvement	Yes, definitely
			Yes, to some extent
			No, I did not feel involved
		Didn't want involvement	I did not want or need to be involved

Derived measure	Original question	Derived measure categories	Response options
Needed information on when could resume usual activities	Q59. Did an ED health professional tell you when you could resume your usual activities, such as when you could go back to work or drive a car?	Needed information	Yes, definitely Yes, to some extent No
		Didn't need information	Not applicable
Treated unfairly	Q69. Were you ever treated unfairly for any of the reasons below?	Treated unfairly	Age Sex Aboriginal background Ethnic background Religion Sexual orientation A disability that you have Marital status Something else
		Not treated unfairly	I was not treated unfairly
Experienced complication or problem during or shortly after ED visit	Q70. Experienced complication or problem during or shortly after ED visit (derived measure)	Had complication	An infection Uncontrolled bleeding A negative reaction to medication Complications as a result of tests or procedures A blood clot A fall Any other complication or problem
		None reported	None of these Missing
Complication or problem occurred during ED visit	Q72. In your opinion, were members of the hospital staff open with you about this complication or problem?	Occurred in ED	Yes, completely Yes, to some extent No
		Occurred after left	Not applicable, as it happened after I left

References

1. Burnham, K. P., & Anderson, D. R. (2002). Model selection and multimodel inference: a practical information-theoretic approach (2nd ed.) New York: Springer.

About the Bureau of Health Information

The Bureau of Health Information (BHI) is a board-governed organisation that provides independent information about the performance of the NSW healthcare system.

BHI was established in 2009 and supports the accountability of the healthcare system by providing regular and detailed information to the community, government and healthcare professionals. This in turn supports quality improvement by highlighting how well the healthcare system is functioning and where there are opportunities to improve.

BHI manages the NSW Patient Survey Program, gathering information from patients about their experiences and outcomes of care in public hospitals and other healthcare facilities.

BHI publishes a range of reports and information products, including interactive tools, that provide objective, accurate and meaningful information about how the health system is performing.

BHI's work relies on the efforts of a wide range of healthcare, data and policy experts. All of our assessment efforts leverage the work of hospital coders, analysts, technicians and healthcare providers who gather, codify and supply data. Our public reporting of performance information is enabled and enhanced by the infrastructure, expertise and stewardship provided by colleagues from NSW Health and its pillar organisations.

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