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Table A: Components and data sources

Perspective	Component	Nurse Prescribing	Patient Group Direction	Data source
NHS	Training and governance	HEI course	Not applicable	Staff questionnaires.
		Senior staff supervision time		
		Study time and back fill		
		Not applicable	Time to write and update PGDs	Time diary to write and update Patient Group Directions
			Committee approval time	
			Time for local training of nurses	
	Clinic processes	Medication delivery, errors, appropriateness, safety		Review of clinic records
		Consultation duration		Nurse diaries
		Impact on workload of other professionals		Nurse diaries, clinical records
Unplanned repeat consultation for index condition		Review of clinic records		
Patients	Patient experience	Consultation experience		Patient questionnaire
		Satisfaction with information about medicines		
Nurse (costs)	Training	Personal study time and loss of leisure		Staff questionnaires
		Out-of-pocket expenses, e.g. travel, materials		
Nurse (benefits)	Prospects	Promotion prospects, lifetime earnings		
		Subjective benefits, job satisfaction		

PGDs= patient group directions; NHS= National Health Service; HEI= Higher Education Institute

Table B: Medication analysis from clinical notes review

Summary statistics	Nurse prescribers			Patient group directions			All
	Medications given	Medications not given	Total	Medications given	Medications not given	Total	Total
Number of presentations/ consultations	399	344 [†]	743	480	459	939	1682
Number of individual drugs	620		620	737		737	1357
Number of drugs per consultation	1.55		1.55	1.54		1.54	1.54
Number of individual errors			879			965	1844
Errors per presentation / consultation			1.18			1.03	1.10
Medication provision errors [‡]	Nurse prescribers (N=879)			Patient group directions (N=965)			Both (% of total)
	Minor	Moderate	Severe	Minor	Moderate	Severe	
Drug interactions not documented	0	2	1	1	6	0	10 (0.5%)
Inappropriate patient group direction use	0	0	0	34	29	0	63 (3.4%)
Medication risk assessment	10	67	0	35	115	2	229 (12.4%)
Prescription documentation omission	458	292	0	514	175	0	1,439 (78.0%)
Under, over, wrong prescribing [‡]	21	27	1	18	36	0	103 (5.6%)
TOTAL (% of all errors)	489 (55.6%)	388 (44.1%)	2 (0.2%)	602 (62.4%)	361 (37.4%)	2 (0.2%)	1844 (100.0%)

[†] 18 consultations taken from nurse diaries [‡]103 related to under, over and wrong prescribing. Nurse prescribers, 24 drugs were considered wrong or overprescribed; 25 instances where drugs were not prescribed but deemed warranted (total cost £324). Patient group direction users, 35 drugs were considered wrong or overprescribed; 19 drugs were not prescribed and deemed warranted (total cost £289).

Table C: Nurses' motivation for independently providing medications

Training motivation	Nurse prescribers (n=26)		Patient group directions (n=35)	
	n	%	n	%
Enhance clinical skills	24	92.3	29	82.9
Improve patient experience	24	92.3	28	80.0
Expectations of employer	16	61.5	30	85.7
Increase knowledge of medications / pharmacology	20	76.9	22	62.9
Facilitate service delivery	20	76.9	26	74.3
Improve job satisfaction	24	92.3	29	82.9
Remove existing restrictions to medication delivery	21	80.8	24	68.6
Obtain academic credits	10	38.5	N/A	

Table D: Summary of findings

Perspective	Item	Nurse prescribers	Patient Group Directions	Balance / comment
NHS: costs and outcomes for services	Resource implications and costs for local services/ employers	Local employers pay fees to enable nurses to attend university courses to gain a nurse prescribing qualification. Service senior staff provide up to 12 days of on-the-job supervision to nurses in training.	Local employers design, approve and implement patient group directions for individual medications, including training of local nurses. Patient group directions are revalidated every three years.	Local services incur costs when designing and implementing patient group directions and supporting nurses to undertake nurse prescribing courses. Once trained, both patient group direction users and nurse prescribers provide medications to large numbers of patients over many years. Unlike nurse prescribers, the scope of practice of patient group directions users is limited.
	Service level outcomes	1.55 medications prescribed per consultation; 96.1% appropriateness; 96.0% safety. 1.18 errors per consultation; 55.6% minor.	1.54 medications prescribed per consultation; 94.0% appropriateness; 99.7% safety. 1.03 errors per consultation; 62.4% minor.	Patient group direction users had higher proportion of inappropriate consultations ($p<0.001$), but a lower error rate ($p=0.001$). No significant difference in safety (high for both groups).
		Mean (SD) consultation durations (minutes): overall 24.9 (12.9); new vs follow-up: 27.3 (13.0) vs 19.6 (10.8); when medication given vs not given: 25.7 (12.7) vs. 23.3 (13.1).	Mean (SD) consultation durations (minutes): overall: 22.8 (13.9); new vs follow-up 25.7 (15.1) vs 19.4 (12.0); when medication given vs not given: 23.3 (14.2) vs. 22.1 (13.3).	Being a new (not follow up) consultation and providing medications added to consultation length for both groups of nurses but no difference between nurse prescribers and patient group direction users.
		Nurse prescribers sought advice from other health professionals in 13% of consultations, mean 11 minutes	Patient group direction users sought advice from other health professionals in 26% of consultations, mean 8 minutes	Nurse prescribers sought support from colleagues less than patient group direction users but for longer durations when they did.
		19.5% unplanned re-consultation rate; none judged potentially unavoidable	17.1% unplanned re-consultation rate; none judged potentially unavoidable	Unplanned re-consultation rates of patient of nurse prescribers and patient group direction users were similar and related to: new clinical issues/ positive test (50%), symptom exacerbations / medication side effects (29%), behaviour (17%).
Patients	Patient level outcomes	Over 96% satisfaction with nurse consultation. Mean score of 13.3 (out of 16) in satisfaction with information around medications	Over 96% satisfaction with nurse consultation. Mean score of 13.5 (out of 16) in satisfaction with information around medications	No differences were observed between patients of nurse prescribers and patients of patient group direction users in satisfaction with consultations or in information provision related to medications.
Nurses	Training costs	Nurses spent an average of 26 days of their own time for studying and £32 on travel and materials costs	Training in patient group directions incurred virtually no personal time or expenditure for most nurses	Nurses undertaking university prescribing courses reported giving up leisure time to study and incurring small out-of-pocket expenditures on travel and books, but they were more likely to be employed in more senior positions with higher remuneration than patient group direction users. Nurse prescribers were motivated by the aims of enhancing the patient experience and improving their clinical skills and job satisfaction. Patient group direction users are more likely to be involved in prescribing in response to an expectation by their employer.
	Prospects	70% of nurse prescribers were salary bands 7 or 8.	83% of nurses using patient group directions were salary bands 5 or 6	

SUPPLEMENTARY TABLES

Supplementary Table 1: Clinical supervision during training reported by nurse prescribers responding to the questionnaire

Participant (n=26)	Designated Medical Practitioner (n=26) (7.5hour days)				Other supervision (n=14 from the 26 respondents) (7.5 hour days)					Overall clinical supervision
	Consultant	Associate Specialist	Registrar	Total	Associate Specialist	Registrar	Nurse Practitioner	Pharmacist	Total	
1	5			5						5
2	11			11						11
3	8			8			✓			8+
4	4.5			4.5				1.5	1.5	6
5	4.5			4.5						4.5
6	8			8						8
7	8			8						8
8	11			11		✓				11+
9			8	8						8
10			11	11						11
11	11			11						11
12	11			11			✓	✓		11+
13	2			2	1.5				1.5	3.5
14	2			2						2
15			8	8						8
16	8			8		2.7	3		5.7	13.7
17			2	2			1		1	3
18		5		5						5
19	2			2						2
20	11			11						11
21	5			5		1	2	1	4	9
22	5			5			1.5		1.5	6.5
23	5			5						5
24		✓		N/A						N/A
25	✓			N/A		✓	✓		N/A	N/A
26	✓			N/A						N/A

✓ = Support from professional group obtained, but no duration reported by participants. + = time on top of this entry, but no additional duration provided by respondent. N/A= unable to ascertain duration.

Supplementary Table 2: Hours and cost of senior staff supervision time during nurse prescriber training, as reported by nurse questionnaires

Measure [†]	Amount of clinical supervision provided during nurse prescribing training where a duration was provided (n=23/26, 88.5%)									
	Designated Medical Practitioner (n=23/26)				Other supervision (n=10/14 from the 26 respondents)					Overall clinical supervision total
	Consultant	Associate Specialist	Registrar	Total [‡]	Associate Specialist	Registrar	Nurse Practitioner	Pharmacist	Total [¶]	
Mean (days)	6.8	5.0	7.3	6.8	1.5	1.9	1.9	1.3	2.5	7.4
SD	3.3	0.0	3.8	3.3	0.0	1.2	0.9	0.4	1.9	3.3
Range	2 to 11 [§]	5	2 to 11 [§]	2 to 11	1.5	1 to 2.7	1 to 3	1 to 1.5	1 to 5.7	1 to 13.7 [§]
Unit cost (/day) [‡]	£1,012.50	£960.00	£442.50	£904.86 (221.84)	£960.00	£442.50	£397.50	£465.00	£486.18 (180.43)	£863.71 (251.00)
Mean cost	£6,885.00	£4,800.00	£3,230.25	£6,153.05	£1,440.00	£840.75	£755.25	£604.50	£1,215.45	£6,391.45

[†]Missing durations entries (n=3/26) not included in this dataset. [‡]Cost calculations: daily cost = [hourly cost] x7.5, mean costs= unit costs/day x total mean supervised days for each section. Hourly costs: Cost of specialist training support was obtained from 'Hospital-based health care staff' in Curtis & Burns (2016); page 191 for doctors: consultant doctor £135/hour; registrar £59/hour; associate specialist £128/hour. Page 188 for nurse practitioner band 7 nurse £53/hour; pharmacist Band 8 £62/hour (pharmacist was considered as Band 8 hospital nurse). [§]where range given mid-point used: 0 to 3 was considered 2 days; 10 or over considered 11 days (full DMP supervision is 12 days; this range considered as 10-12). Overall supervision includes DMP time and additional supervision so overall range increases. [¶]Total and total costs are weighted based on full data set (i.e. not a mean of means). SD= standard deviation

Supplementary Table 3: Study time (days) during nurse prescriber training reported by nurse respondents to questionnaire

Salary band	Responses (n)	Units (£) [†]	Study days				
			Measure	Range	Mean [†]	Standard Deviation	Total
6	7	£44/hr £330/day	n	3 to 26	16.7	9.4	117
			£	£990 to £8,580	£5,511.00	n/a	£38,610.00
7	12	£53/hr £397.50/day	n	1 to 31	19.6	9.2	235
			£	£397.50 to £12,322.50	£7,791.00	n/a	£93,412.50
8	5	£62/hr £465.50/day	n	26	26	0	130
			£	£12,103	£12,103.00	n/a	£60,515.00
All reported [‡]	24	£394.50/day	n	1 to 31	20.1	8.6	482
			£	£394.50 to £12,229.50	£7,929.45	n/a	£192,537.50

[†]Day cost= hourly costx7.5. Costs were based on from 'Hospital-based health care staff' in Curtis & Burns (2016); page 188 for Band 5 nurse £35/hour, Band 6 nurse £44/hour, Band 7 £53/hour, Band 8 nurse £62/hour. [‡]All means calculated from full relevant dataset (i.e. not based on mean of means).

Supplementary Table 4: Time to write and obtain committee approval for patient group directions based on observation log

Resource	Write patient group direction		Update patient group direction [†]	
	Hours	Cost [‡]	Hour	Cost [‡]
Time to write patient group directions				
Primary patient group direction author (Band 8 nurse/ researcher)	5.1	£316.20	1.3	£80.60
Consultant doctor	0.8	£108.00	0.1	£13.50
Combined resource from department's Band 8 team (2x nurses)	1.8	£111.60	0.2	£12.40
Total	7.8	£535.80	1.7	£106.50
Committee time to approve patient group directions				
Lead pharmacist (Band 8)	0.5	£31.00	0.2	£12.40
Lead directorate nurse (Band 9)	0.5	£61.00	0.2	£24.40
Lead directorate clinician (consultant doctor)	0.5	£67.50	0.2	£27.00
Non-medical prescribing committee (x7 Band 8 nurses)	3.5	£217.00	1.7	£105.40
Total	5.0	£376.50	2.3	£169.20
Overall total to write and approve	13.8	£912.30	4.0	£275.70

[†]The total time to update a suite of nine patient group directions was divided by nine to give an approximate time to update each individual patient group direction. [‡]Duration to write patient group directions were approximations based on the researcher's log or estimations. Costs were based on from 'Hospital-based health care staff' in Curtis & Burns (2016); page 188 for Band 8 nurse £62/hour (and pharmacist was considered as Band 8 hospital nurse), and Band 9 nurse £122/hour, page 191 for doctors £135/hour.

Supplementary Table 5: Formal Patient Group Direction training resources

Category of Patient Group Direction training reported [†]	Responses from formal PGD teaching (n=29)		Number of PGD trainees in group					Training hours				
			Responses		Range (persons)	Mean	SD	Responses		Range (hrs)	Mean (hrs)	SD
	n	%	n	%				n	%			
Class teaching	23	79.3	14	60.9	1 to 30	10.9	7.8	14	60.9	0.5 to 30	5.2	8.6
Question & answer	20	69.0	7	35.0	1 to 15	9.1	4.7	5	25.0	0.5 to 8	2.7	3.0
Workshops	6	20.7	3	50.0	5 to 13	8.5	3.8	2	33.3	1 to 2	1.5	0.7
Self-directed learning	20	69.0						7	35.0	2.5 to 15	6.9	5.1
e-learning	10	34.5						4	40.0	1 to 5	2.1	1.9
One-to-one training	11	37.9						4	36.4	1 to 20	7.0	8.8

[†] Respondents may have had multiple methods of patient group direction training. Calculations based on completed entries in the staff questionnaires; mid-points used when a range given. Skewed results as a large amount of training involved lone training or classroom teaching with multiple students (i.e. e-learning 10 respondents reported lone personal training, whereas two respondents detailed classroom teaching with 30 students undertaking a contraception course which involved patient group directions as one part of a larger syllabus). Interquartile range not used due to small sample size and need to capture all variations of patient group directions training. Trainers' costs not included, or time taken to design training packages (as unable to calculate from data collected). PGD= patient group direction; SD= standard Deviation

Supplementary Table 6: Professional study time (hours) during training reported by patient group direction users responding to questionnaire

Band	Responses (n)	Units (£) [†]	Study hours (hours)						
			Measure	Range	Mean [†]	SD	Median	Mode	Total
5	4	£35/hr	n	0 to 15	4.3	7.2	1	0	17
			£	£0 to £525	£150.50	£252.00	£35.00	£0.00	£595.00
6	21	£44/hr	n	0 to 11.3	2.1	2.9	0	0	44.3
			£	£0 to £497.20	£92.40	£127.60	£0.00	£0.00	£1949.20
7	5	£53/hr	n	0 to 85.2	26	38.4	0	0	130.2
			£	£0 to £4,515.60	£1,378.00	£2,035.20	£0.00	£0.00	£6,900.60
All reported [‡]	30	£44.30/hr	n	0 to 85.2	6.4	17.2	0	0	191.5
			£	£0 to £3,774.36	£283.52	£761.96	£0.00	£0.00	£8,483.45

[†] Costs were based on from 'Hospital-based health care staff' in Curtis & Burns (2016); page 188 for Band 5 nurse £35/hour, Band 6 nurse £44/hour, Band 7 £53/hour. This includes data from a university contraception training module that was not specific to patient group directions but did facilitate delivery of contraception through patient group directions. [‡]All results calculated and weighted from full relevant dataset (i.e. not based on mean of means). SD= standard deviation.