Patient preference regarding timing of discharge after elective percutaneous coronary intervention: a best-worst scaling.

The PRETOD study

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ABSTRACT

Background: With the continuous improvement of stent techniques and antiplatelet drugs, same-day discharge is both feasible and safe in selected patients undergoing elective percutaneous coronary intervention. While the majority of the patients go home happily after the procedure, other patients feel hesitant about early discharge.
Objectives: The primary objective of this study was to explain patient preference regarding the timing of discharge after elective percutaneous coronary intervention by using a best-worst scaling approach. Secondary objective was to explore a potential association between preference and anxiety measured by the generalized anxiety disorder 7-item scale. Additionally, potential associations with sociodemographic-, clinical-, and procedural-characteristics and preference were explored.
Methods: Through literature review and expert consultation, thirteen objects were identified that could possibly influence preference for timing of discharge. A patient sample who underwent coronary angiography and/or percutaneous coronary intervention (n=118) at Thorax Centrum Twente, the Netherlands, participated in the study. Conditional logit models were fitted to estimate the relative importance of each belief in influencing patients' preference. Univariate analysis was performed to identify a potential association between preference and anxiety and other sociodemographic-, clinical-, and procedural-characteristics.
Results: The majority of patients prefer same-day discharge (n=78; 66.1%). Patients considered feeling more at ease, feeling calmer, and the presence of family and friends to be the most important reasons for their preferred timing of discharge. Least important reasons for patient preference were presence of fellow-patients, and performing daily activities. Subgroup analysis showed that the estimated object importance was different across the same-day discharge and overnight-hospital stay preference groups. No statistically significant association was found between anxiety and preference, however, preference was found a statistically significant association between procedure type and preference for timing of discharge.
Conclusion: Although same-day discharge after elective percutaneous coronary intervention is feasible and safe, this study shows that some patients prefer overnight-hospital stay. This study implies that patients are discharged home the same day despite their preference for overnight-hospital stay. In order to provide patient centered care, healthcare professionals should not only consider a medical discharge checklist but also patient preference for timing of discharge. In addition, healthcare professionals should ascertain reasons for patients to be hesitant against same-day discharge, so that barriers for same-day discharge could be overcome.

Abbreviations

AP	Angina Pectoris
BWS	Best-Worst Scaling
B-W	Best minus Worst
CABG	Coronary Artery Bypass Grafting
CAD	Coronary Artery Disease
CAG	Coronary Angiography
CCS	Canadian Cardiovascular Society
COPD	Chronic Obstructive Pulmonary Disease
CTO	Chronic Total Occlusion
DM	Diabetes Mellitus
GAD-7	Generalized Anxiety Disorder 7-item scale
MI	Myocardial Infarction
ONS	Overnight-Hospital Stay
OR	Odds Ratio
PCI	Percutaneous Coronary Intervention
SDD	Same-Day Discharge

Introduction

With the continuous improvement of stent techniques, increased use of the radial approach, and more potent antiplatelet drugs, same-day discharge (SDD) is both feasible and safe in selected patients undergoing elective percutaneous coronary intervention (PCI)[1-3]. Previous research has shown that SDD does not result in additional complications compared to overnight-hospital stay (ONS)[3].

SDD may reduce healthcare costs incurred by elective PCI-procedures. The savings in healthcare costs ranged from €258 to €1,141 per patient, without any harm to the same-day discharged PCI patients[3,4]. In addition, PCI as a day case procedure might reduce logistic constraints on hospital resources by minimizing problems with bed availability[1].

Although SDD is safe, little data is available on individual patient preferences regarding the timing of discharge after elective PCI. Patient preferences are a central part in evidence based medicine[5]. To improve healthcare, patient-centered care should be a central part of evidence based medicine, implying that the system of healthcare should revolve

around the patient, put the patient in control, and respect patient preferences[6]. Furthermore, patient's perception of quality of healthcare increasingly reflects the extent to which their preferences are taken into account[7]. In practicing evidence based medicine, evidence alone is never sufficient to make a clinical decision: patient's values and preferences should be taken into account when decision makers trade off the benefits and risks of alternative health strategies[8].

Only limited research is done in patient preference for timing of discharge. This limited research indicates that most patients prefer SDD after elective PCI[3,5]. However, when interested in patient preference, not only the stated preference is of importance, but also the underlying patient perspectives, beliefs, expectations and goals for health and life that explain the preference[8]. Yet, no data is available on reasons and beliefs underlying preferences for timing of discharge.

Patient's ability to handle stress, as well as anxiety of not being monitored, is another issue with SDD[5]. Therefore, the research hypothesis is that: patient preference differs across patients with different levels of anxiety. To our knowledge no research has been done to identify, all together, the extent to which the level of anxiety and other patient characteristics, beliefs and perspectives are associated with a specific preference for timing of discharge. When healthcare professionals can predict patient preference regarding timing of discharge based on patient-, clinical-, and procedural-characteristics, patient-centered discharge decision making could occur.

Therefore, the aim of this study is to explain patient preference regarding timing of discharge after elective PCI by conducting a preference-elicitation survey. Secondary objective of this study is to explore whether self-reported anxiety levels are associated with patient preference. Additionally, potential associations with sociodemographic-, clinical-, and procedural-characteristics and preference will be explored.

Methods

Study design

In this study a quantitative cross-sectional design was used, in which a sample of patients provided their preference by using a computer-administered questionnaire. Patients were recruited to complete the PRETOD questionnaire while waiting in the intervention center to be discharged. Before the study began, the research protocol was submitted for consideration, comment, guidance and approval by the Research Ethics Committee. The Research Ethics Committee and the board of directors provided their approvals for administering the questionnaire.

Study population

In May and June 2016, this study was performed in a consecutive series of patients who underwent an elective CAG- or/and PCI-procedure at Thorax Centrum Twente, the Netherlands. Patients were included into the study when scheduled to undergo elective PCI or CAG, or when patients were scheduled to undergo a diagnostic CAG with ad hoc PCI. Participation was optional and patients could choose not to participate in this research or to withdraw.

Scheduled patients within the research period were excluded whenever (i) patients had no angina pectoris (AP) prior to inclusion, (ii) urgent PCI was performed because of an ST-elevated myocardial infarction (MI), (iii) a CAG or PCI was required as part of a regular work-up for another treatment like heart valve repair, invasive treatment of heart rhythm disease, or implementation of cardiac devices like a pacemaker or an implantable cardioverter defibrillator (ICD) as part of another study, (iv) renal insufficiency requiring pre- and post-hydration occurred and therefore required an ONS, (v) known with an intolerance for the used contrast fluid, in which case the patient might be required to stay overnight after the procedure, (vi) patients had insufficient knowledge of Dutch language, or (vii) patients had a cognitive impairment.

Sample size calculation

It is not yet possible to calculate power levels for Case 1 Best-Worst Scaling (BWS) and the associated minimum desired sample sizes, because the properties of some estimators, for example BWS scores, have yet to be formally proved[9]. Sample sizes in the range of 1,000 to 2,000 respondents will lead to small confidence intervals (CIs), even if the experimental design is not efficient. However, research by Orme (2010) showed that many conjoint analysis applications in health included samples sizes of 100 to 300 respondents[10]. On the basis of this research, the minimum sample size was set at 100 respondents. However, a larger sample size was desirable in order to reduce the CIs.

Data collection

Data was collected by designing and administering a questionnaire. The first part of the questionnaire consisted of thirteen questions about sociodemographic patient characteristics, including: gender, age, procedure type, nationality, education level, living status, employment status, travel distance to the hospital, anxiety, discharge status, satisfaction with procedure and satisfaction with hospital stay. Anxiety was measured by the generalized anxiety disorder 7-item scale (GAD-7), a brief measure for assessing generalized anxiety disorder. This anxiety scale ranges from 0 to 21 points. At a cut point score of 10, sensitivity (89%) and specificity (82%) are optimal. Increasing scores on the GAD-7 are strongly associated with multiple domains of functional impairment (Short Form-20 Health-Related Quality of Life Scales). Anxiety was classified by levels of anxiety severity: minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21)[11].

The second part of the questionnaire was conducted to elicit patient preference regarding timing of discharge after their current PCI. Patients who underwent CAG were asked to imagine that they underwent PCI that day. This question was completed under the assumption that patients themselves could choose their timing of discharge after PCI. Both patient groups could choose between two options: SDD or ONS.

In the third part of the questionnaire, patients were asked to complete a BWS. BWS is a stated preference elicitation technique of which "Case 1" BWS was selected to examine the relative value of each reason (henceforth referred to as "object") associated with a list of objects (Louviere, 1990; Finn, 1992). The questionnaire in which patients were asked to choose the best and worst of multiple objects, was based on thirteen choice sets, containing four objects per choice set. The theoretical framework of BWS is the random utility theory (RUT). In the RUT, it is assumed that people make errors in the evaluation of objects, but when picking the same object frequently, the choice frequencies give an indication of how much the object under consideration is valued[12]. The experimental design of the BWS was based on a Balanced Incomplete Block Design (BIBD) in

which every object appeared the same number of times (Balanced) and every object co-appeared with every other object the same number of times (Orthogonal).

Through literature review and consultation with patients and healthcare professionals, thirteen objects were selected that possibly influence patient preference[2,5,13]. Table 1 shows the list of objects that emerged as important objects.

Table 1 Objects included in the BWS.

Object	Description in questionnaire
Comfortable environment[13]	I feel more at ease on the chosen place.
Deal with stressful situation[13]	I feel calmer on the chosen place.
Contact with family and friends	The presence of family and friends.
Contact with fellow-patients	The presence of fellow-patients.
Safety	I feel safer on the chosen place.
Taking care of family or pets	The care for family of pets that I have to take.
Resumption of daily life	My daily activities I need to perform, such as work.
Quality of care	The quality of care I receive at the selected spot.
Complication[2]	The risk of a complication after procedure.
Privacy	I have more privacy on the chosen place.
Provision of information	The speed and ease with which I am in contact with the nurse or doctor.
Perceived expectation[2]	This is common practice.
Control over health[5]	Control of my health.

The BWS consisted of 13 choice tasks. In every BWS task, four objects were shown and patients were asked to pick one object that was most important and one that was least important for their preferred timing of discharge. A pilot test of the questionnaire was carried out with six people at the same age category as the patient population to ensure that the questions and directions were clear.

Before completing the questionnaire, patients were provided with two pieces of information: (i) an information letter regarding the goal, design, burden, and advantages of this study, access to medical records, and privacy; and (ii) an informed consent to give the researcher access to medical records. Of patients who gave written informed consent, clinical- and procedural- characteristics were collected from medical records to explore a potential association with preference. Clinical-characteristics included: *comorbidity* (diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), hypertension, and depression); *coronary history* (prior MI, prior CAG, prior PCI, and prior coronary artery bypass grafting (CABG)); *type AP;* and *AP classification*. Procedural-characteristics for both groups included access-site; significant coronary artery disease (CAD); and chronic total occlusion (CTO). For patients who underwent PCI, additional procedural-characteristics were collected, including: dilatation; number of lesions treated per patient; and lesion type.

Data analysis

Data was presented by frequencies and percentages for dichotomous and categorical variables. Age was reported as mean ± standard deviation, including minimum and maximum. Potential differences in sociodemographic-, clinical- and procedural-characteristics between the PCI- and CAG-group were identified by a Chi-square test and Fisher's exact tests for dichotomous and categorical variables and by a Student's t-test for continuous variables.

To investigate patient beliefs that explain patient preference, most important and least important choices were counted and ordered by best minus worst (B-W) scores[9]. These totals were rescaled to the number of respondents and the standard deviations were calculated. Positive values of B-W indicate that the objects were chosen more frequently as best than as worst and vice versa[14]. Furthermore, for the individual BWS scores the median and interquartile range were determined. Finally, boxplots were created to provide a visual representation of the results.

Conditional (fixed effects) logistic regression was performed to analyze BWS data in detail. By means of this analysis, object importance regarding timing of discharge was determined. Instead of coefficients, ORs were calculated in order to present the BWS data more easily. The larger the odds ratio of an object, the more often that object was valued as most important by patients, compared to the reference object. In addition, subgroup analysis by preference (SDD and ONS) was performed in order to explore whether subgroups valued objects differently.

Eventually, associations between anxiety and other patient characteristics (including for example gender, age, and education) and preference for timing of discharge were examined by using univariate analysis. To account for possible confounders and to identify independent predictors, a logistic regression model with preference as the dependent variable was conducted. The analyses were conducted by using SPSS 23 and Stata 13. All statistical tests were two-tailed. *P* values less than 0.05 were considered statistically significant.

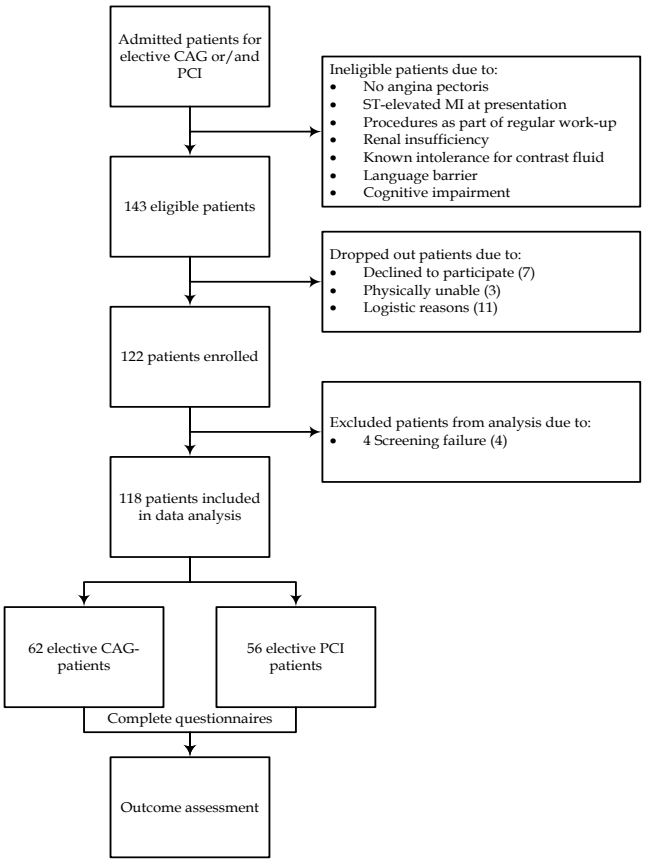

Figure 1 Flowchart of patient recruitment procedure and response.

Results

Recruitment

Of the 143 eligible and invited patients, a total of 122 patients completed the PRETOD Questionnaire. Figure 1 displays a flowchart of the recruitment procedure and the response of participants to the invitation. Reasons for eligible patients not to participate were: lack of interest, physically unable, or lost to follow-up. Among the 122 patients who completed the questionnaire, 4 patients were excluded from analyses, because these patients were hospitalized in a referring hospital for several days prior to the current procedure, which could have impacted their preference.

Sample characteristics

Table 2 displays sociodemographic-, clinical- and procedural-characteristics of the patient population and separately of the PCI- and CAG-groups. Most patients were male (72.9%), of Dutch descent (94.1%), middle educated (44.9%) and had a minimal level of anxiety (50.8%). The mean age was 64.4 years.

Between PCI- and CAG-patients, there were no statistically significant differences in sociodemographic characteristics. However, patients in the PCI-group had statistically significant experienced a prior MI than patients in the CAG-group (48.2% vs. 24.2%, $p = 0.01$) and had undergone more often a prior CAG (89.3% vs. 51.6%, $p < 0.001$). In both types of procedures, the majority was carried out via radial access (73.2% in the PCI-group and 74.2% in the CAG-group, $p = 0.19$).

Preference scores

The majority of the total respondents prefer SDD (66.1%; n=78). However, there was a statistically significant association between procedure types and preference ($p < 0.001$). PCI-patients prefer SDD more often (87.5%; n=49) than CAG-patients (46.8%; n=29). The degree of association between procedure and preference is between weak and moderately strong (Cramer's V = 0.430).

Model estimation

118 PRETOD questionnaires were used in the BWS analysis, giving rise to 1,534 choice situations. Estimates of object importance, by best and worst counting, are presented in Table 3. Feeling more at ease was chosen as the most important reason for patients' preference for timing of discharge (1.35) and while performing daily activities was chosen as least important reason for patients' preference for timing of discharge (-1.58).

Figure 2, Figure 3 and Figure 4 show the boxplots of the individual BWS scores for both preferences, and separately for SDD and ONS. Figure 2 shows that patients value feeling more at ease, feeling calmer, and the presence of family and friends more often as most important reason for their preference, compared to the other objects. The evaluation of the received quality of care was more equally divided compared to other objects, because the object shows the smallest variability. On the other hand, patients value presence of family and friends, feeling safer, performing daily activities, the risk of a complication after procedure, and control over patients' health with a higher variability, which implicates that patients value these objects less equal. Therefore, boxplots of individual B-W

Table 2 Characteristics of the study population.

Characteristics	Total	PCI	CAG	*p* value
No. of patients	118	56	62	
Sociodemographic characteristics				
Men	86 (72.9)	43 (76.8)	43 (69.4)	0.41
Age	64.4 ± 10.9	63.3 ± 10.5	65.4 ± 11.2	0.29
Min-max	36-88	41-84	36-88	
Nationality				0.71
Dutch	111 (94.1)	52 (92.9)	59 (95.2)	
Non-Dutch	7 (5.9)	4 (7.1)	3 (4.8)	
Employment status				0.58
Employed	51 (43.2)	26 (46.4)	25 (40.3)	
Unemployed	67 (56.8)	30 (53.6)	37 (59.7)	
Education level				0.71
Low educated	38 (32.2)	16 (28.6)	22 (35.5)	
Middle educated	53 (44.9)	27 (48.2)	26 (41.9)	
High educated	27 (22.9)	13 (23.2)	14 (22.6)	
Living status				0.64
Together	96 (81.4)	47 (83.9)	49 (79.0)	
Alone	22 (18.6)	9 (16.1)	13 (21.0)	
Travel distance				0.79
0-5 kilometers	52 (44.1)	25 (44.6)	27 (43.5)	
6-10 kilometers	37 (31.4)	16 (28.6)	21 (33.9)	
>11 kilometers	29 (24.6)	15 (26.8)	14 (22.6)	
GAD-7				0.80
Minimal	60 (50.8)	30 (53.6)	30 (48.4)	
Mild	33 (28.0)	15 (26.8)	18 (29.0)	
Moderate	18 (15.3)	7 (12.5)	11 (17.7)	
Severe	7 (5.9)	4 (7.1)	3 (4.8)	
Clinical characteristics*				
DM	21(17.8)	8 (14.3)	13 (21.0)	0.34
COPD	16 (13.6)	6 (10.7)	10 (16.1)	0.43
Hypertension	43 (36.4)	20 (35.7)	23 (37.1)	0.85
Depression	4 (3.4)	1 (1.8)	3 (4.8)	0.62
Prior MI	42 (35.6)	27 (48.2)	15 (24.2)	0.01
Prior CAG	82 (69.5)	50 (89.3)	32 (51.6)	<0.001
Prior PCI	51 (43.2)	28 (50.0)	23 (37.1)	0.26
Prior CABG	15 (12.7)	4 (7.1)	11 (17.7)	0.10
Type AP†				0.44
Unstable AP	40 (33.9)	17 (30.4)	23 (37.1)	
Stable AP	75 (63.6)	38 (67.9)	37 59.7)	
CCS AP†/‡				0.44
One	14 (11.9)	4 (7.1)	10 (16.1)	
Two	41 (34.7)	22 (39.3)	19 (30.6)	
Three	28 (23.7)	13 (23.2)	15 (24.2)	
Four	32 (27.1)	16 (28.6)	16 (25.8)	
Procedural characteristics*				
Access-site				0.19
Radial	87 (73.7)	41 (73.2)	46 (74.2)	
Femoral	26 (22.0)	12 (21.4)	14 (22.6)	
Both	3 (2.5)	0 (0.0)	3 (4.8)	
Significant CAD	75 (63.6)	56 (100.0)	19 (30.6)	<0.001
CTO	14 (11.9)	8 (14.3)	6 (9.7)	0.57
Dilatation	55 (98.2)	55 (98.2)	-	-
No. of lesions treated				-
One	22 (18.6)	22 (39.3)	-	
Two	21 (17.8)	21 (37.5)	-	
Three or more	13 (11.0)	13 (23.2)	-	
Lesion type				-
A	4 (3.4)	4 (7.1)	-	
B1	12 (10.2)	12 (21.4)	-	
B2	8 (6.8)	8 (14.3)	-	
C	32 (27.1)	32 (57.1)	-	
Discharge status				0.06
SDD	110 (93.2)	49 (87.5)	61 (98.4)	
ONS	6 (5.1)	5 (8.9)	1 (1.6)	
Unknown	2 (1.7)	2 (3.6)	0 (0.0)	

Values are n (%), mean ± SD, or minimum - maximum.

* Two patients are missing due to no given informed consent.

† One patient is missing due characteristic to not recorded in medical record.

‡ CCS: Canadian Cardiovascular Society Grading scale: (i) angina only during strenuous or prolonged physical activity; (ii) slight limitation, with angina only during vigorous physical activity; (iii) symptoms with everyday living activities, moderate limitation; (iv) inability to perform any activity without angina or angina at rest, severe limitation[15].

Table 3 Estimates of object importance by best worst counting.

Objects	B-W totals	Rescaled B-W	Std. dev. Rescaled B-W	Median	Interquartile range
Comfortable environment	159	1.35	1.75	1	0 to 3
Deal with stressful situation	112	0.95	1.50	1	0 to 2
Family contact	106	0.90	2.23	1	-1 to 3
Patient contact	-184	-1.56	1.46	-2	-3 to -1
Safety	41	0.35	1.93	0	-1 to 2
Care for family	-61	-0.52	1.85	-1	-2 to 0
Resumption of daily life	-186	-1.58	1.83	-2	-3 to 0
Quality of care	58	0.49	1.37	0,5	0 to 1
Complication	-9	-0.08	2.17	0	-2 to 1
Privacy	-8	-0.07	0.89	0	-1 to 1
Provision of information	8	0.07	1.74	0	-1 to 1
Perceived expectations	-88	-0.75	1.88	-1	-2 to 0
Control over health	52	0.44	1.95	0	-1 to 2

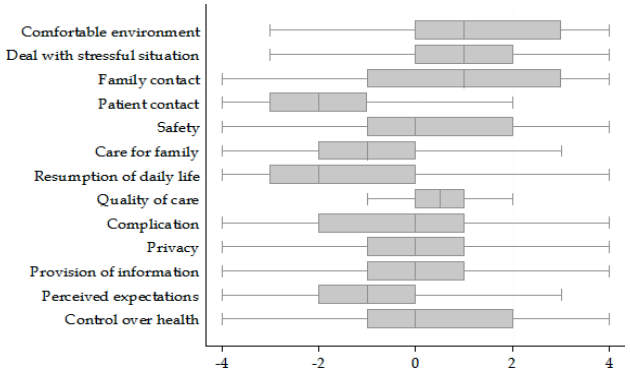

Figure 2 Boxplots of individual best-worst scores for both preferences

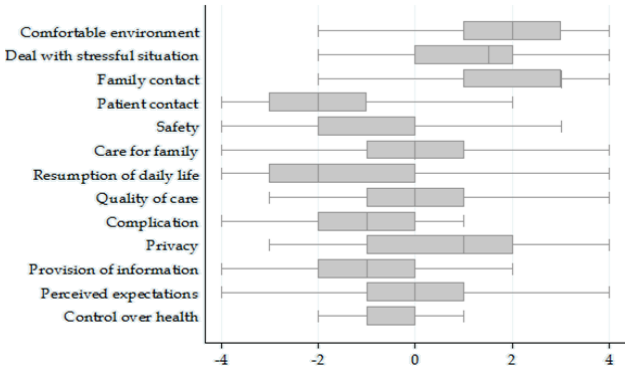

Figure 3 Boxplots of individual best-worst scores for same-day discharge

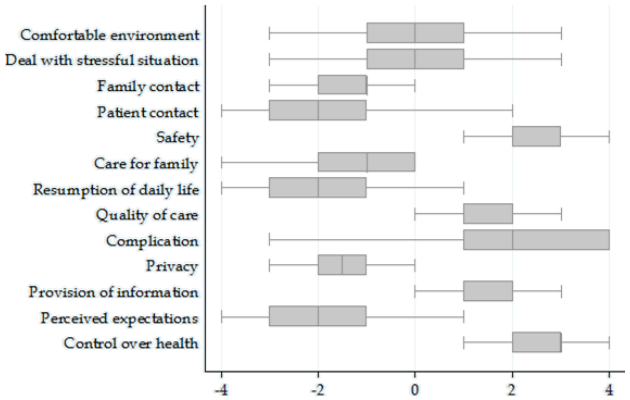

Figure 4 Boxplots of individual best-worst scores for overnight-hospital stay

Table 4 Conditional logistic regression model.

Objects	Faction	OR	95% CI		$p>\|z\|$
Comfortable environment	Total	4.52	3.71	5.49	<0.001
	SDD	6.75	5.21	8.74	<0.001
	ONS	3.97	2.68	5.89	<0.001
Deal with stressful situation	Total	3.64	3.00	4.41	<0.001
	SDD	4.26	3.33	5.44	<0.001
	ONS	5.63	3.75	8.45	<0.001
Family contact	Total	3.55	2.93	4.31	<0.001
	SDD	6.97	5.37	9.05	<0.001
	ONS	1.69	1.15	2.49	<0.001
Patient contact	Total	1.02	0.84	1.23	0.84
	SDD	0.94	0.74	1.19	0.61
	ONS	1.29	0.90	1.86	0.17
Safety	Total	2.72	2.25	3.29	<0.001
	SDD	1.54	1.21	1.95	<0.001
	ONS	19.08	12.29	29.60	<0.001
Care for family	Total	1.74	1.44	2.09	<0.001
	SDD	2.00	1.58	2.53	<0.001
	ONS	1.61	1.11	2.33	0.01
Resumption of daily life	Total				
	SDD		REFERENCE		
	ONS				
Quality of care	Total	2.93	2.42	3.55	<0.001
	SDD	2.14	1.69	2.71	<0.001
	ONS	12.21	7.99	18.66	<0.001
Complication	Total	2.21	1.83	2.66	<0.001
	SDD	1.15	0.91	1.45	0.25
	ONS	18.23	11.75	28.29	<0.001
Privacy	Total	2.19	1.82	2.64	<0.001
	SDD	3.24	2.54	4.12	<0.001
	ONS	1.35	0.93	1.96	0.12
Provision of information	Total	2.36	1.95	2.85	<0.001
	SDD	1.53	1.21	1.93	<0.001
	ONS	12.04	7.88	18.40	<0.001
Perceived expectations	Total	1.55	1.29	1.87	<0.001
	SDD	1.87	1.48	2.37	<0.001
	ONS	1.33	0.90	1.95	0.15
Control over health	Total	2.84	2.35	3.44	<0.001
	SDD	1.58	1.25	1.99	<0.001
	ONS	24.42	15.55	38.35	<0.001

scores for SDD and ONS are presented. Figure 3 shows that the most important reasons for patients to prefer SDD are feeling more at ease, feeling calmer, and the presence of family and friends. On the other hand, least important reasons for patients to prefer SDD are the presence of fellow-patients and performing daily activities. Figure 4 shows that the boxplots of individual B-W scores for ONS overlay less, meaning that patients assign distinct values to the objects. The two most important reasons for patients to prefer ONS are feeling safer and control over patients' health.

Table 5 Univariate analysis for association.

Characteristics	Prefer SDD	Prefer ONS	*p* value
No. of patients	78	40	
Sociodemographic characteristics			
Men	61 (78.2)	25 (62.5)	0.08
Age	64.4 ± 10.5	64.5 ± 11.6	0.97
Procedure type			<0.001
PCI	49 (62.8)	7 (17.5)	
CAG	29 (37.2)	33 (82.5)	
Employment status			1.00
Employed	34 (43.6)	17 (42.5)	
Unemployed	44 (56.4)	23 (57.5)	
Education level			0.28
Low educated	22 (28.2)	16 (40.0)	
Middle educated	39 (50.0)	14 (35.0)	
High educated	17 (21.8)	10 (25.0)	
Living status			0.09
Together	67 (85.9)	29 (72.5)	
Alone	11 (14.1)	11 (27.5)	
Travel distance			0.44
0-5 kilometers	33 (42.3)	19 (47.5)	
6-10 kilometers	23 (29.5)	14 (35.0)	
>11 kilometers	22 (28.2)	7 (17.5)	
GAD-7			0.81
Minimal	42 (53.8)	18 (45.0)	
Mild	21 (26.9)	12 (30.0)	
Moderate	11 (14.1)	7 (17.5)	
Severe	4 (5.1)	3 (7.5)	
*Clinical characteristics**			
DM	11 (14.1)	10 (25.0)	0.20
COPD	10 (12.8)	6 (15.0)	0.78
Hypertension	29 (37.2)	14 (35.0)	1.00
Depression	3 (3.8)	1 (2.5)	1.00
Prior MI	31 (39.7)	11 (27.5)	0.23
Prior CAG	58 (74.4)	24 (60.0)	0.14
Prior PCI	35 (44.9)	16 (40.0)	0.70
Prior CABG	9 (11.5)	6 (15.0)	0.57
Type AP†			0.68
Unstable AP	25 (32.1)	15 (37.5)	
Stable AP	51 (65.4)	24 (60.0)	
CCS AP classification†/‡			0.67
One	10 (12.8)	4 (10.0)	
Two	29 (37.2)	12 (30.0)	
Three	16 (20.5)	12 (30.0)	
Four	21 (26.9)	11 (27.5)	
*Procedural characteristics**			
Access-site			0.65
Radial	59 (75.6)	28 (70.0)	
Femoral§	18 (23.1)	11 (27.5)	
Significant CAD	57 (73.1)	18 (45.0)	0.01
CTO	9 (11.5)	5 (12.5)	1.00

Values are n (%), mean ± SD, or minimum-maximum

* Two patients are missing due to no given informed consent.

† One patient is missing due to characteristic not recorded in medical record.

‡ CCS: Canadian Cardiovascular Society Grading scale: (i) angina only during strenuous or prolonged physical activity; (ii) slight limitation, with angina only during vigorous physical activity; (iii) symptoms with everyday living activities, moderate limitation; (iv) inability to perform any activity without angina or angina at rest, severe limitation[15].

§ Patients with both access-sites were classified as femoral.

While, patients value three objects as least important for their ONS preference, including: the presence of fellow-patients, performing daily activities and commonality of the preferred timing of discharge.

Table 4 shows the relative importance of each object associated with preference for timing of discharge by a conditional logistic regression model. The importance of each object was estimated relative to "resumption of daily life" which was rated as least important object. Patients value feeling more at ease 4.5 times higher than the performance of daily activities (OR 4.52, $p < 0.001$). Feeling calmer and the presence of family and friends are the second and third most important reasons, and are valued 3.6 and 3.55 times higher, respectively, than performing daily activities (OR 3.64, $p < 0.001$; OR 3.55, $p < 0.001$). All other objects seem to be of intermediate importance except for the presence of fellow-patients, which is close to the reference object (OR 1.02, p 0.844).

Subgroup analysis shows that the estimated importance of each object relative to the reference is different across the SDD and ONS preference groups, also shown in Table 4. The results from the SDD group analysis show that patients value the presence of family and friends and feeling more at ease 7 and 6.7 times higher than performing daily activities (OR 6.97, $p < 0.001$; OR 6.74, $p < 0.001$). The presence of fellow-patients was valued 0.94 times as high as the reference (OR 0.94, p <0.605). The results from the ONS group analysis show that the control over patient's health, feeling safer and the risk of a complication after the procedure are valued 24.4, 19.1 and 18.2 times higher than performing daily activities (OR 24.4, $p < 0.001$; OR 19.1, $p < 0.001$, OR 18.2, $p < 0.001$). On the other hand, patients with a preference for ONS value presence of fellow-patients, to have more privacy, and the commonality of the preferred timing of discharge close to the reference (OR 1.3, $p < 0.169$; OR 1.3, $p < 0.119$; OR 1.3, p <0.149), meaning that patients value these objects more often as least important to prefer ONS.

Associations between patient characteristics and preference scores

Table 5 presents the univariate analysis of associations between various characteristics and preference. There is no statistically significant association between anxiety and preference ($p = 0.81$). However, analysis shows five associations with a p value ≤ 0.15, including: gender ($p = 0.08$); procedure type ($p < 0.001$); living status ($p = 0.09$); prior CAG ($p = 0.14$); and significant CAD ($p = 0.01$).

Of these five characteristics a logistic regression model was made to ascertain the effect on the likelihood that participants have a preference for overnight-hospital say. The logistic regression model was statistically significant χ_2 (5) = 26.6, $p < 0.001$ and explained 28.4% (Nagelkerke R^2) of the variance in preference. Procedure type was statistically significant in the model ($p < 0.001$), meaning that patients who undergo a CAG-procedure have 10.1 higher odds to prefer ONS than patients who have had a PCI-procedure. Other variables were not statistically significant in the logistic regression model.

Discussion

Interpretation of results

The aim of this study was to assess reasons and beliefs underlying patient preference for timing of discharge after elective PCI. This study shows that the majority of patients prefer SDD after elective PCI and that

beliefs and reasoning for preference differs across preference groups based on received procedure.

The main reasons for patients to prefer SDD were presence of family and friends, feeling more at ease, and feeling calmer. The two least important reasons to prefer SDD were resumption of daily life and presence of fellow-patients. However, it was expected that resumption of daily life would be important to this preference group. An explanation for this unexpected outcome is that the term 'work activities' was used in the description of this object. The facts that the majority of patients were unemployed and advise was given to rest for three days, might explain the outcome.

The main reasons for patients to prefer ONS were the control over patients' health, feeling safer, and the risk of a complication after treatment. The two least important reasons to prefer ONS were presence of fellow-patients and performing daily activities.

Prior to this research, it was hypostasized that preference for timing of discharge is different across different levels of anxiety. The results of this study indicate that preference does not differ across the different levels of anxiety. I.e. patients with severe anxiety did not prefer ONS more often than patients with minimal anxiety. However, patients who preferred ONS did list the reasons related to perceived and actual safety as important drivers for their preference.

While patients in the CAG- and PCI-group did not differ statistically significant on the basis of sociodemographic characteristics, most clinical and procedural related characteristics, an unexpected difference in preference between these groups was found. The CAG-group stated to prefer SDD less often than the PCI-group. This result might implicate that CAG-patients are reluctant towards a PCI procedure or might had difficulty imagining what it is like to undergo a PCI-procedure.

Results from previous studies

The results of this study indicate that the majority of patients prefer SDD, this is in agreement with the study other studies[3,5].

A pilot randomized controlled trial (RCT) by Kim et al. (2013) reported that SDD was preferred by most patients undergoing elective PCI via femoral access[5]. Of the 150 patients and 148 patients randomized to SDD and ONS, 80% and 68% stated to prefer SDD if they had another PCI. In this study patients with sub-optimal angiographic outcomes and clinical complications during PCI were excluded. Secondly, patients indicated for more than 3 stents were excluded. Moreover, the study was limited to patients younger than 65 years of age and type A or B lesions[5].

In the RCT of Heyde et al. (2007), 704 patients completed a patient satisfaction questionnaire in which patients were asked for their preference for timing of discharge in the event of repeat PCI[3]. Patients randomized to SDD preferred SDD in 73% of the cases versus 32% of ONS patients. However, patients were excluded whenever: (i) scheduled to undergo CAG with possible ad hoc PCI; (ii) guiding catheters >6F in diameter, elective glycoprotein IIb/IIIa receptor blockers, or long-term systemic anticoagulation were used; (iii) lived >60 minutes away from intervention center[3].

In the intervention center where this research was performed, SDD is already common practice and only 5% of the total patient population was not discharged the same-day as the procedure. Keeping in mind that the previously mentioned studies were RCTs, the findings of preference for patients randomized to SDD are compared to the findings in this study. Previous studies showed a slightly higher percentage of patients with a preference for SDD: 80% and 73% against 66% of the total patients with a preference for SDD in this study. However, when considering patient preference for SDD in patients who have undergone elective PCI, the percentage is higher (87.5%), which may be caused by the fact that SDD is already common practice.

Remarkably, the percentage of PCI patients with a preference for SDD in this study is higher while: (i) no exclusion based on age, (ii) no exclusion of C lesions, (iii) no exclusion of CTO's, (iv) no exclusion of patients with clinical complications, (v) no exclusion of patients with ad hoc PCI when scheduled for CAG occurred. This means that previous studies used a relatively healthy population and our study population might represent the overall patient population more completely. In addition, our study explained underlying reasons for a specific preference by a BWS.

Study strengths

BWS overcomes many of the reliability issues that are inherent with simple rating scales[14]. In addition, by using a BWS more information could be obtained compared to discrete choice experiments and less burden was placed on the patient than a full ranking of all choice options[16]. By forcing patients to choose one most and one least preferred reason in every choice set, rich information on the relative importance of the beliefs and reasons was provided. Variation in choice set size was avoided by using a BIBD.

It was attempted to prevent confounding, by excluding patients who were hospitalized in a referring hospital for several days prior to the current procedure, which could have impacted their preferred timing of discharge greatly. Selection bias was prevented by including all patients who have undergone a CAG- or PCI-procedures during the entire study period.

The feasibility of the questionnaire was improved by a pilot study with six participants, before the PRETOD questionnaire was introduced. This resulted in a few textual changes.

Study limitations

Notwithstanding these new insights, this study has several limitations that must be taken into consideration while interpreting the results. One concern is the limited total number of patients in the study, causing bounded subgroup analysis for the association between the different levels of anxiety and preference with respondents per subgroups ranging from three to forty-two.

While the concept, value and usage of patient preference in healthcare is well recognized, the implementation poses a challenge to patients[17]. This challenge is also recognized in the present study. Patients often presumed clinicians' preeminence in the decision on timing of discharge.

In addition, CAG-patients seemed to have difficulty imagining what a PCI-procedure entails. A reason is that the majority of CAG-patients did not undergo a PCI-procedure and therefore did not receive adequate information about a PCI-procedure. The consequence is that confounding by indication could have occurred. However, at baseline all known and measurable determinants for preference where equal between the CAG- and PCI-patients.

So, although a pilot study was conducted, the feasibility of the questionnaire was slightly limited. The former two issues led to the decision to assist patients with completing the questionnaire. The face validity of the questionnaire is therefore preserved. However, a disadvantage of this method is that patients could choose socially desirable answers, e.g. on the GAD-7 questions. In addition, questionnaires were completed in a common room with de presence of fellow-patients. Therefore, patients who have expressed their preference publicly could have influenced fellow-patients.

Implications for policy and clinical implications

Several recommendations are made for future research. First, similar studies should be conducted with a larger sample size to confirm our outcomes. Second, this study should be repeated in other hospitals and other countries to check whether the conditions of the hospital and country might influence the preference. Third, to our knowledge all sociodemographic-, clinical-, and procedural-characteristics that could influence preference are included in this study. However, other characteristics should be identified in order to predict patient preference for timing of discharge based of patient characteristics. Last, anxiety was measured by GAD-7 which is a general measurement tool. This means that anxiety need not necessarily had to be related to the PCI-procedure. Therefore, we recommend to repeat this study with a measurement tool that measures anxiety specifically related to the procedure.

Within the context of the findings presented in this study, two specific practice- and policy-related issues emerged that healthcare professionals might consider as they provide healthcare to PCI-patients. First, make clear during the patient information sessions that SDD is safe in the majority of patients undergoing elective PCI. Only if patients truly understand potential risks and benefits, patient's stated preference will reflect their real preference[18]. So, patient education about safety of SDD after elective PCI is crucial in ensuring the success of a SDD program[2]. A supplementary implication to policy is that policymakers should ensure that patient information leaflets are equivalent to practice. Current information leaflets imply that ONS is common practice.

Second, discharging of patients should not be done solely based on clinical features, but sociodemographic characteristics of patients and their preference should be considered too. For example, in this study 50% (n=11) of patients who live alone, compared to 30% (n=29) of patients who live together prefer ONS. It is recommended to establish a support system for patients who live alone to overcome problems of self-reliance and uncertainty. Healthcare professionals should support family care or arrange home care for patients who life alone. If no social safety net could be arranged, ONS should be considered.

Conclusion

This study shows that the majority of patients prefer SDD after elective PCI and that reasoning for preference differs across preference groups. The main reasons for patients to prefer SDD were presence of family and friends, feeling more at ease, and feeling calmer. The two least important reasons to prefer SDD were performing daily activities and the presence of fellow-patients. The main reasons for patients to prefer ONS were the control over patients' health, feeling safer, and the risk of a complication. The two least important reasons to prefer ONS were the presence of fellow-patients and performing daily activities. No statistically significant association between anxiety and preference was found.

This study implies that patients are discharged home the same day despite their preference for ONS. In order to provide patient centered care, healthcare professionals should not only consider a medical discharge checklist but also patient preference for timing of discharge. In addition, healthcare professionals should ascertain reasons for patients to be hesitant against SDD, so that barriers for SDD could be overcome.

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