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Systematic Review and Analysis of Postdischarge Symptoms after Outpatient Surgery

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OVER the past decade, the percentage of surgical procedures being performed in outpatient centers has increased. In response, outpatient anesthetic practice and research have focused on providing anesthetics that minimize symptoms (*e.g.*, nausea and vomiting) in the postanesthesia care unit and hasten time to discharge. Much effort has been placed on development of newer agents with a more favorable recovery profile.[1–5] Similarly, examination of the economic parameters (*e.g.*, length of recovery room stay, cost-effectiveness of drugs) after ambulatory surgery has focused on the immediate predischarge, postoperative period.[6–8] A significant portion of research in this area has concentrated on minimizing immediate postoperative symptoms to facilitate patient discharge from the hospital.[9]

On the other hand, relatively few studies have evaluated the impact of patient-reported symptoms after discharge from the postanesthesia care unit. Postdischarge symptoms (those occurring after discharge from the ambulatory surgical unit) may have an important impact on patient recovery after ambulatory surgery and the economic burden on patients and their caregivers[10]; however, there has not been a systematic examination of postdischarge symptoms. It is important to know the frequency with which patients experience postdischarge symptoms so that providers can better inform patients and researchers can better estimate the burden of these symptoms and potential for the incidence of postdischarge symptoms to serve as a measure of quality of care. Quantification of the incidence of postdischarge symptoms would be the first step in the process in determining the extent of the problem and if perioperative interventions (*e.g.*, intraoperative anesthetic technique, multimodal analgesia, or pharmacologic agents) would be effective in diminishing the impact of these patient-related symptoms on functional recovery and health-related quality of life. Therefore, we conducted a systematic review and analysis to evaluate the incidence of patient-reported symptoms after outpatient surgery.

Methods

Study Selection Criteria

We identified and reviewed all studies that met the following criteria: *design*, case series or observational trials; *population*, patients undergoing outpatient or ambulatory surgical procedures; *intervention*, none; *outcomes*, postdischarge pain, postoperative nausea and vomiting, fatigue, headache, drowsiness, other signs and symptoms, and recovery of function. In addition, we used the "related articles" feature of PubMed, which identified related articles using a hierarchical search engine not solely based on MeSH headings.

Citation Search Strategy

We searched MEDLINE (from 1966 through January 2000) *via* PubMed using the following MeSH terms: outpatients, ambulatory surgical procedures, pain, postoperative nausea and vomiting, fatigue, headache, drowsiness, other signs and symptoms, and recovery of function. The text term *dizziness* was also used. The results were limited to those in the English language and adult patient population. In addition, references from all of the eligible articles selected by the investigators (C.L.W., S.M.B.) were reviewed to identify additional relevant articles.

Study Selection

After identification of all citations based on our search strategy, two of the authors (C.L.W., S.M.B.) independently reviewed each abstract to confirm eligibility for inclusion. Because we were interested in determining the natural history of postdischarge symptoms, we excluded articles in which any intervention was protocolized (as might occur in a randomized controlled trial). If an abstract was selected as eligible, the same authors independently reviewed the respective article to confirm that it met inclusion criteria. A third reviewer (P.J.P.) was used to resolve discrepancies.

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Data Extraction

Using a data collection form, we extracted data from the studies to describe patient characteristics, study methodology, and study findings. We also abstracted quantitative data on the incidence of postdischarge symptoms after outpatient surgery. All data were abstracted by the two primary reviewers, again with discussion used to resolve differences. Reviewers were not blinded to author, institution, or journal, as such masking has been shown to make little difference to the results of a systematic review.

Data Synthesis and Analysis

We measured the percent agreement before discussion between reviewers in study selection, study design, and data abstraction. For data synthesis, we constructed evidence tables to present data separately for the main outcome variables: pain, nausea, vomiting, headache (both nonspecific and postdural puncture headache), drowsiness, dizziness, and fatigue. We evaluated the incidence of each of these complications and attempted to summarize the outcome data from each study with an overall incidence (OI) and range. In addition, for each outcome, we evaluated how (telephone survey, mail survey, or follow-up visit) and when (1 day, 2–3 days, >3 days after discharge) the outcomes were assessed.

Results

Literature Review

The results from "outpatients[MeSH]" and "ambulatory surgical procedures[MeSH]" were combined using the "OR" function to yield 7,634 articles. The results from "pain[MeSH]," "postoperative nausea and vomiting[MeSH]," "fatigue[MeSH]," "headache[MeSH]," "drowsiness[MeSH]," "signs and symptoms[MeSH]," "recovery of function[MeSH]," and "dizziness" were combined using the "OR" function to yield 610,505 articles. The results of these two searches were combined as described previously to yield a total of 556 references in the English language. Initial assessments of these abstracts by the two independent reviewers yielded 150 articles that were retrieved for further evaluation. Correlation between observers was high (r = 0.94). Another 35 abstracts were sent a third reviewer for a decision, and an additional six articles were retrieved for further review.

Of the 156 articles evaluated, 125 were excluded from further consideration for various reasons: the article did not study outpatients (n = 2), examine postdischarge symptoms (n = 9), or assess the incidence of postdischarge symptoms (*e.g.*, measured visual analog pain scores instead of incidence of pain; n = 34). Another 58 were excluded because of the presence of a protocolized intervention (*e.g.*, randomized trial comparing different antiemetics), and 22 were excluded as the authors were unable to determine the actual incidence of postdischarge symptoms (*e.g.*, the incidence of predischarge and postdischarge symptoms were combined into a single score).

Study Characteristics

Of the 31 articles that met our inclusion criteria (table 1), 13 (42%) assessed the incidence of postdischarge pain, 12 (39%) assessed nausea alone, 11 (35%) assessed vomiting alone, 5 (16%) assessed nausea and vomiting combined, 15 (48%) assessed headache (nonspecific), 8 (26%) assessed postdural puncture headache, 7 (23%) assessed back pain in patients undergoing neuraxial techniques, 7 (23%) assessed drowsiness, 7 (23%) assessed dizziness, 3 (10%) assessed fatigue–tiredness, 3 (10%) assessed myalgia, and 7 (23%) assessed sore throat. The OI and range for each symptom from these studies, as well as the year of publication, type of population studied, method of surveillance, time of surveillance, number of patients reporting the symptom of interest, total number of patients studied, and incidence of symptoms are shown in the tables.

The study populations included orthopedic patients in 2 studies (6%), gynecologic patients in 4 studies (13%), and a mixed sample in 25 studies (81%) (table 1). Sample sizes varied from 49 to 5,264 patients, with a mean sample size of 632 patients and a median of 194 patients. Ten studies (32%) evaluated the outcome variable by phone survey, 18 studies (58%) by mail surveys, 2 studies (7%) evaluated the outcome variable by follow-up visits, and 1 study (3%) did not report the method used. Sixteen (52%), 3 (10%), and 9 (29%) surveys evaluated symptoms less than 3 days, 3–7 days, and greater than 7 days, respectively, after discharge. Data for time of assessment of postdischarge symptoms was not available for 3 surveys (10%).

We were unable to provide meaningful confidence intervals for the results of the studies examined because of the marked heterogeneity present. The OI of postdischarge pain for 13 studies (table 2) was approximately 45% and ranged from 6 to 95%. When evaluated by method of surveillance, surveys using a mail-in questionnaire (OI: 35%; range: 6–95%) reported a wider variability than those using telephone contact (OI: 53%; range: 26–60%).

The OI of postdischarge nausea (table 3) for 12 studies was 17% (range: 0–55%). When evaluated by method of surveillance, surveys using telephone contact reported a different range than those using a mail-in questionnaire or follow-up visit (OI: 20%; range: 17–55% *vs.* OI: 17%; range: 0–30% and OI: 9%; range: 5–11%, respectively).

The OI of postdischarge emesis (table 4) for 11 studies was 8% (range: 0–16%). When evaluated by method of surveillance, the extent of differences between surveys appeared to be less than that of other symptoms surveys,

Table 1. Studies Included in Analysis

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	N	Outcome(s) assessed
Fahy, 1969[74]	Mixed	Visit	N/A	408	Nausea, emesis, headache, drowsiness, dizziness
Ogg, 1972[75]	Mixed	Mail	1	99	Pain, nausea, emesis, headache, drowsiness, dizziness, sore throat
Brindle, 1975[76]	Mixed	Mail	7	418	Nausea, emesis, headache, dizziness, myalgia, sore throat
Collins, 1984[77]	Gyn	Mail	2	49	Pain, headache, sore throat, backache
Flaatten, 1985[78]	Mixed	Mail	7	51	PDPH, backache
Mackenzie, 1987[79]	Gyn	Mail	N/A	194	Pain
Clarke, 1988[80]	Mixed	Mail	7	50	Nausea, emesis, headache, PDPH
Quaynor, 1990[81]	Mixed	Mail	7	105	PDPH, backache
Read, 1990[14]	Mixed	Mail	14–21	211	Pain, PONV
Sarma, 1990[82]	Mixed	Mail	7	160	PDPH, backache
Maffulli, 1991[83]	Ortho	Visit	7	195	Nausea, emesis, headache, PDPH, backache
Duncan, 1992[84]	Mixed	Phone	3	1410	Nausea, emesis, headache, myalgia, sore throat, backache
Philip, 1992[17]	95% Gyn	Mail	1	1511	Pain, nausea, emesis, headache, drowsiness, dizziness, myalgia, fatigue, sore throat
Brattebo, 1993[85]	Mixed	Phone	3	133	Headache, PDPH, backache
Corbey, 1993[86]	Mixed	Mail	7	186	Headache
Birch, 1994[87]	GU	Mail	1	86	Nausea, emesis, headache, drowsiness, dizziness
Larijani, 1994[88]	Mixed	Phone	1	66	Nausea
Hardwick, 1994[89]	Mixed	Mail	1	50	Pain
Carroll, 1995[16]	Mixed	Phone	1	193	Nausea, emesis
Roberts, 1995[90]	Gyn	Mail	1	106	Nausea, headache, drowsiness, sore throat
Chung, 1996[12]	Mixed	Phone	1	778	Pain, PONV, headache, drowsiness, dizziness
Chung, 1997[18]	Mixed	Phone	1	3729	Pain
Rawal, 1997[19]	Mixed	Mail	2	956	Nausea, emesis, fatigue (n = 1035)
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	89	Pain, PONV, headache, drowsiness, dizziness, fatigue, sore throat
Callesen, 1998[91]	Mixed	Mail	1	500	Pain
Despond, 1998[92]	Ortho	Phone	3	214	PDPH, backache
Hunter, 1998[11]	Mixed	Mail	1	553	Pain, PONV, headache
Corbey, 1998[93]	Mixed	N/A	N/A	363	PDPH
Stockdale, 1998[94]	Mixed	Phone	2	111	Pain, emesis
Sinclair, 1999[15]	Mixed	Phone	1	5264	PONV
Lau, 2000[95]	Mixed	Phone	1	271	Pain

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; PDPH = postdural puncture headache; Phone = telephone contact; PONV = postoperative nausea and vomiting; Visit = follow-up visit.

with telephone contact reporting an OI of 11% with a range of 5–16% *versus* that of mail-in questionnaires (OI: 7%; range: 0–8%) or follow-up visits (OI: 3%; range: 2–3%). Five studies[11–15] evaluated both nausea and vomiting as a combined entity but were not included in the tables; however, the OI of nausea and vomiting was 9% (range: 4–27%).

The OI of postdischarge headache (table 5) from all causes for 15 studies was 17% (range: 2–30%). The OI of postdischarge postdural puncture headache (table 6) for 8 studies was 9% (range: 1–37%). The associated OI of backache in these patients was reported as 27% (range: 11–55%).

The OI of postdischarge drowsiness (table 7) for 7 studies was 42% (range: 11–62%). The OI of postdischarge dizziness (table 8) for 7 studies was 18% (range: 7–41%). The OI of postdischarge fatigue or tiredness (table 9) for 3 studies was 21% (range: 19 —54%). Finally, the OIs of postdischarge myalgia and sore throat were 31% (range: 9–47%) and 37% (range: 6–47%), respectively.

Discussion

Postdischarge symptoms may potentially delay patient recovery and increase costs after ambulatory surgery. The incidence of some postdischarge complications after outpatient surgery has been investigated but not quantified in a systematic fashion.[16,17] Although our systematic review of the relevant literature found that there was marked heterogeneity in the incidence of postdischarge symptoms (those occurring after discharge from the hospital), the OI of postdischarge symptoms in patients undergoing outpatient surgery was approximately 45% for pain, 17% for nausea, 8% for vomiting, 17% for headaches (nonspecific), 9% for postdural puncture headaches (with an associated 27% incidence of backache), 42% for drowsiness, 18% for dizziness, and 21%

Table 2. Incidence of Postdischarge Pain after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Pain	Total Patients Studied	Incidence of Pain
Ogg, 1972[75]	Mixed	Mail	1	17	99	17.1%
Collins, 1984[77]	Gyn	Mail	2	27	49	55.1%
Mackenzie, 1987[79]	Gyn	Mail	N/A	134	194	69.1%
Read, 1990[14]	Mixed	Mail	14–21	12	211	5.7%
Philip, 1992[17]	95% Gyn	Mail	1	468	1511	31%
Hardwick, 1994[89]	Mixed	Mail	1	42	50	84%
Chung, 1996[12]	Mixed	Phone	1	209	778	26.9%
Chung, 1997[18]	Mixed	Phone	1	2249	3729	60.3%
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	80	84	95.2%
Callesen, 1998[91]	Mixed	Mail	1	125	500	25%
Hunter, 1998[11]	Mixed	Mail	1	219	553	39.6%
Stockdale, 1998[94]	Mixed	Phone	2	60	111	54.1%
Lau, 2000[95]	Mixed	Phone	1	56	271	26.1%
Overall incidence				3508	7675	45%
Range						6–95%

Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; Ortho = orthopedic surgery; Phone = telephone contact.

for fatigue. Moreover, we found that the incidence of these symptoms may be affected by how and when the symptoms are assessed.

The incidence of moderate to severe postdischarge pain is approximately 25–35%,[18,19] despite the advances in surgical techniques that have minimized surgical trauma and diminished the associated postoperative incisional pain.[20,21] Postdischarge pain is one of the most common causes for readmission after outpatient surgery[22–24] and can be especially burdensome for certain groups of outpatients, including those undergoing tubal ligation and orthopedic procedures.[20,25–27] Increased pain is associated with increased difficulty in performing activities of daily living (ADL) and may interfere with resumption of normal activity levels.[25] Of all types of outpatient surgical procedures, patients undergoing outpatient orthopedic procedures may have the highest incidence of severe pain immediately after surgery (approximately 16%) and after discharge to home (approximately 11%).[18]

The presence of postdischarge symptoms may potentially impede resumption of normal daily activity and function.[16,25] For example, patients with postdischarge nausea and vomiting require a longer time to resume normal activities.[16] Nausea and vomiting in the immediate postoperative period (*e.g.*, postanesthesia care unit) may not accurately predict the incidence after discharge from the hospital.[16] Approximately 36% of patients who experience postdischarge nausea and vomiting do not experience any nausea or vomiting before discharge from the hospital. In patients undergoing outpatient inguinal hernia repair or laparoscopy, postdischarge symp-

Table 3. Incidence of Postdischarge Nausea after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Nausea	Total Patients Studied	Incidence of Nausea
Fahy, 1969[74]	Mixed	Visit	N/A	44	408	10.8%
Ogg, 1972[75]	Mixed	Mail	1	22	99	22.2%
Brindle, 1975[76]	Mixed	Mail	7	65	418	15.6%
Clarke, 1988[80]	Mixed	Mail	7	2	50	4%
Maffulli, 1991[83]	Ortho	Visit	7	9	195	4.6%
Duncan, 1992[84]	Mixed	Phone	3	243	1412	17.2%
Philip, 1992[17]	95% Gyn	Mail	1	257	1511	17%
Birch, 1994[87]	GU	Mail	1	0	86	0%
Larijani, 1994[88]	Mixed	Phone	1	36	66	54.5%
Carroll, 1995[16]	Mixed	Phone	1	57	193	29.5%
Roberts, 1995[90]	Gyn	Mail	1	32	106	30.2%
Rawal, 1997[19]	Mixed	Mail	2	182	956	19.0%
Overall incidence				949	5500	17%
Range						0–55%

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; Phone = telephone contact; Visit = follow-up visit.

Table 4. Incidence of Postdischarge Emesis after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Emesis	Total Patients Studied	Incidence of Emesis
Fahy, 1969[74]	Mixed	Visit	N/A	16	408	3.9%
Ogg, 1972[75]	Mixed	Mail	1	8	99	8.1%
Brindle, 1975[76]	Mixed	Mail	7	34	418	8.1%
Clarke, 1988[80]	Mixed	Mail	7	0	50	0%
Maffulli, 1991[83]	Ortho	Visit	7	4	195	2.1%
Duncan, 1992[84]	Mixed	Phone	3	155	1412	11.0%
Philip, 1992[17]	95% Gyn	Mail	1	106	1511	7%
Birch, 1994[87]	GU	Mail	1	0	86	0%
Carroll, 1995[16]	Mixed	Phone	1	30	193	15.5%
Rawal, 1997[19]	Mixed	Mail	2	73	946	7.7%
Stockdale, 1998[94]	Mixed	Phone	2	6	111	5.4%
Overall incidence				432	5429	8%
Range						0–16%

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; Phone = telephone contact; Visit = follow-up visit.

toms may interfere with resumption of ADLs such that only 22% of patients are back to work by the seventh postoperative day.[28] Of patients undergoing a variety of ambulatory surgical procedures, approximately 14% experience symptoms of 3 or more days' duration, and 62% of patients require an average of 3.2 postoperative days to resume ADLs because of persistence of symptoms such as malaise (57%) and pain (38%).[17] Thus, it appears that postdischarge symptoms may impede resumption of ADLs and return to preoperative functional levels after outpatient surgery.

Given how common these symptoms are and how they may impede resumption of ADLs, further understanding of their economic impact is needed, including an estimate of the attributable costs of these symptoms. Although postdischarge symptoms after ambulatory surgery may potentially delay recovery and increase the overall costs of ambulatory surgery, in part through increases in direct (unanticipated admission or readmission because of complications) or indirect (employment) costs, the attributable impact of postdischarge symptoms on cost of care and patient recovery is not clear. There are little data evaluating the economic effect of postdischarge symptoms after outpatient surgery. For example, it is unclear whether postdischarge symptoms are associated with a delay in return to work.[16,25]

There are limitations to our study that may impact our results. First, we excluded studies that included interventions, such as those present in randomized controlled trials. Because our goal was to estimate the inci-

Table 5. Incidence of Postdischarge Headache (Nonspecific) after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Headache	Total Patients Studied	Incidence of Headache
Fahy, 1969[74]	Mixed	Visit	N/A	52	408	12.7%
Ogg, 1972[75]	Mixed	Mail	1	27	99	27.3%
Brindle, 1975[76]	Mixed	Mail	7	71	418	17.0%
Collins, 1984[77]	Gyn	Mail	2	9	49	18.4%
Clarke, 1988[80]	Mixed	Mail	7	13	50	26%
Maffulli, 1991[83]	Ortho	Visit	7	52	195	26.7%
Duncan, 1992[84]	Mixed	Phone	3	136	1412	9.6%
Philip, 1992[17]	95% Gyn	Mail	1	378	1511	25%
Brattebo, 1993[85]	Mixed	Phone	3	18	153	11.8%
Corbey, 1993[86]	Mixed	Mail	7	18	186	9.7%
Birch, 1994[87]	GU	Mail	1	2	86	2.3%
Roberts, 1995[90]	Gyn	Mail	1	32	106	30.2%
Chung, 1996[12]	Mixed	Phone	1	90	778	11.6%
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	24	89	27%
Hunter, 1998[11]	Mixed	Mail	1	106	553	19.2%
Overall incidence				922	5540	17%
Range						2–30%

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; Phone = telephone contact; Visit = follow-up visit.

Table 6. Incidence of Postdischarge Postdural Puncture Headache after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with PDPH	Total Patients Studied	Incidence of PDPH
Flaatten, 1985[78]	Mixed	Mail	7	19	51	37.2%
Clarke, 1988[80]	Mixed	Mail	7	9	50	18%
Quaynor, 1990[81]	Mixed	Mail	7	8	105	7.6%
Sarma, 1990[82]	Mixed	Mail	7	15	160	9.4%
Maffulli, 1991[83]	Ortho	Visit	7	36	195	18.5%
Brattebo, 1993[85]	Mixed	Phone	3	5	133	3.8%
Corbey, 1998[86]	Mixed	N/A	N/A	4	363	1.1%
Despond, 1998[92]	Ortho	Phone	3	18	214	8.4%
Overall incidence				114	1271	9%
Range						1–37%

Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; PDPH = postdural puncture headache; Phone = telephone contact; Visit = follow-up visit.

dence of postdischarge symptoms in the general population, we did not include randomized controlled trials in our analysis. Estimates of event rates in randomized controlled trials may be significantly lower than those in observational studies,[29] and had we included the control groups from randomized controlled trials, we may have biased our results toward a lower incidence of postdischarge symptoms. Second, there may have been biases, including publication bias, as we limited our search to the published literature and English language.[30] Finally, there are also limitations in the available literature that may limit the ability to compare rates of complications among outpatient centers. For instance, we found that there was not a consistent definition of postdischarge pain, with some investigators recording the presence of pain as "incisional"[13] or "surgical."[17] In addition, other investigators did not specify the exact definition of pain.[11] Other limitations of existing studies are discussed in the following section. In general, a systematic review or metaanalysis is a useful tool to identify, evaluate, and synthesize data from a variety of sources and may be used to combine observational studies; however, one of the dangers of metaanalyses is the tendency to oversimplify a complex issue.[31]

Methodologic Issues in Assessing Postdischarge Symptoms

Heterogeneity in Symptoms Definition and Data Collection. An accurate assessment of postdischarge symptoms would be valuable as a possible measure of quality of care; however, there are significant methodologic issues that need to be addressed before establishment of a standard method of evaluation of these symptoms. One of the most significant problems in currently available studies is the presence of heterogeneity in not only the definitions of symptoms but also the format of data collection. For example, we found substantial variation in the incidence of symptoms (*e.g.*, postdischarge pain, nausea, and emesis) by method of surveillance. This may be a result of variation in how and when the symptom was assessed. The marked heterogeneity present in the studies evaluated may limit the usefulness of any combined or pooled result and may be a reflection of the heterogeneity in data collection. Our study highlights the problem with variation in surveillance methods for postoperative symptoms, and, if the incidence of symptoms is to be used as a measure of quality of care, we must obtain consensus on surveillance methods.

Table 7. Incidence of Postdischarge Drowsiness after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Drowsiness	Total Patients Studied	Incidence of Drowsiness
Fahy, 1969[74]	Mixed	Visit	N/A	122	408	29.9%
Ogg, 1972[75]	Mixed	Mail	1	26	99	26.2%
Philip, 1992[17]	95% Gyn	Mail	1	937	1511	62%
Birch, 1994[87]	GU	Mail	1	17	86	19.8%
Roberts, 1995[90]	Gyn	Mail	1	50	106	47.2%
Chung, 1996[12]	Mixed	Phone	1	89	778	11.4%
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	40	89	44.9%
Overall incidence				1281	3077	42%
Range						11–62%

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; Phone = telephone contact; Visit = follow-up visit.

Table 8. Incidence of Postdischarge Dizziness after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Dizziness	Total Patients Studied	Incidence of Dizziness
Fahy, 1969[74]	Mixed	Visit	N/A	29	408	7.1%
Ogg, 1972[75]	Mixed	Mail	1	11	99	11.1%
Brindle, 1975[76]	Mixed	Mail	7	171	418	40.9%
Philip, 1992[17]	95% Gyn	Mail	1	302	1511	20%
Birch, 1994[87]	GU	Mail	1	9	86	10.5%
Chung, 1996[12]	Mixed	Phone	1	75	778	9.6%
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	20	89	22.5%
Overall incidence				617	3389	18%
Range						7–41%

GU = urologic surgery; Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; N/A = not available; Ortho = orthopedic surgery; Phone = telephone contact; Visit = follow-up visit.

Validity and Reliability of Available Instruments. Currently available survey instruments used to assess the incidence of postdischarge symptoms are generally not psychometrically constructed or may not be valid and reliable. The results obtained from these instruments, if not validated, may or may not reflect the true incidence of postdischarge symptoms. The steps by which a survey instrument is psychometrically created and assessed for validity and reliability are described elsewhere.[32,33] A few validated and reliable instruments used to evaluate patients' recovery profile and functional status after surgery are available.[34,35]

Survey Response and Bias. The extent and completeness of the response to the survey instrument are important to the external validity (ability to generalize the results of the study to a larger population) of the study. The typical response rate of medical mail surveys is approximately 62%.[36] The effect of nonresponders is particularly important because of the possibility of a nonresponse bias. Nonresponders may differ from responders with regard to demographics, gender, socioeconomic status, and severity of disease or symptoms.[37–40] In addition, patients who have less favorable outcomes or are less satisfied with their medical care are less likely to respond to surveys.[41,42] Thus, the response rate may affect the external validity of the results as the nonresponders may significantly differ from responders and are not typically included in analysis.[36,42]

Patient recall may be another source of bias (recall bias) in trials using survey instruments. Although the timing of many telephone interviews for assessment of postdischarge symptoms is typically close to the time of surgery (24–48 h after surgery), asking patients to recall their health status over a longer time period may introduce recall bias.[43,44] The extent of recall bias increases when patient recall is poor. The factors that affect and contribute to recall bias are reviewed elsewhere.[45]

Data Collection. As seen with the different incidences of symptoms varying by the method of surveillance in our study, there are differences between methods of data collection (*e.g.*, mail *vs.* telephone) with regard to the response rate, completeness of data collected, and even results obtained, although a portion of these differences may be attributed to the nonresponse bias (see above). Patients tend to rate their health status differently with different modes of data collection.[38,46,47] There are also differences in demographic and socioeconomic variables among telephone and mail respondents.[48]

The use of telephone for survey data collection may be advantageous with regard to completeness of data collected; however, the advantages of telephone survey administration are not as clear when considering the data collection rate and administrative costs.[38,49,50] In addition, differences in demographic and socioeconomic variables may be present between those who do and do not have access to a telephone, thus potentially leading to a nonresponse bias.[48,51] Finally, some data

Table 9. Incidence of Postdischarge Fatigue or Tiredness after Ambulatory Surgery

Study	Study Population	Method of Surveillance	Time of Surveillance (Days)	Patients with Fatigue	Total Patients Studied	Incidence of Fatigue
Philip, 1992[17]	95% Gyn	Mail	1	287	1511	19%
Rawal, 1997[19]	Mixed	Mail	2	214	1035	20.7%
Beauregard, 1998[13]	Gyn, Ortho	Mail	1	48	89	53.9%
Overall incidence				549	2635	21%
Range						19–54%

Gyn = gynecologic surgery; Mail = mail-in questionnaire or diary; Mixed = multiple types of surgery; Ortho = orthopedic surgery.

suggest that there are differences in socioeconomic and health-related characteristics between those with and without a telephone.[51]

Missing Data. Data analysis for missing points (item omission) may affect interpretation of survey results.[52] Because the response and item collection rates for survey work are rarely 100% complete, methods are available to address the statistical handling of such data.[42,53,54] It is important to note whether missing items are random or systematic (which may imply a faulty survey instrument), especially if the response rate is low.[42] The possible causes for nonresponse and any potential differences between responders and nonresponders are important if imputed values for missing data are to be considered. Use of proxies (*e.g.*, family members or friends) should be discouraged as proxies may not accurately reflect the views and reports (*e.g.*, level of pain) of the patient.[55,56]

Future Directions and Summary

Postoperative symptoms are common after outpatient surgery and may be a significant burden on patients and their caregivers. We have begun to realize that postdischarge symptoms after outpatient surgery may be a significant factor in patient recovery and resumption of normal activities after ambulatory surgery. Of the studies that have measured the incidence of postdischarge symptoms, only a few have investigated their impact on patient recovery after ambulatory surgery. The extent of delay in resumption of normal activities in patients with postdischarge symptoms and the overall impact of postdischarge symptoms on patient recovery and cost after outpatient surgery currently is not clear. By further understanding the attributable costs of postdischarge symptoms, we may be able to prioritize our efforts on symptoms that impose the largest economic burden.

Creation of Valid and Reliable Survey Instruments

As previously mentioned, many studies have collected data using instruments that have not undergone psychometric construction or been tested for reliability and validity. Validation of surveys used to collect information on postdischarge symptoms is important in the process of formulating accurate conclusions on the effect of these symptoms on patient recovery. Few validated instruments have traditionally been available for evaluating patient recovery in the immediate postoperative period; however, some instruments assessing patients' postoperative health status and functional status have recently become available.[34,35]

Quantification of Postdischarge Symptoms

Although we have presented symptoms here that are most commonly reported in the literature, there may be other symptoms that may have a greater impact on resuming normal function after outpatient surgery. Some postdischarge symptoms (*e.g.*, pain, nausea and vomiting) have been studied in greater detail, whereas others (*e.g.*, fatigue, drowsiness, headache, and dizziness) have not been extensively examined. A comprehensive understanding of the incidence and duration of postdischarge symptoms on patient recovery may direct future investigations on the economic impact of postdischarge complications. Quantification of the effect of postdischarge symptoms on resumption of normal patient activities and determination of factors (*e.g.*, type of surgery, specific postdischarge symptoms) that may predispose patients for a prolonged postdischarge recovery are needed.

Assessment of Postdischarge Symptoms as an Indicator of Quality of Care

Assessment of the presence of postdischarge symptoms could be incorporated into measures that may provide a reliable and valid means for evaluating quality of care in patients undergoing outpatient surgery. Anesthesiologists and professional societies will need to be proactive in the creation and implementation of quality measures for ambulatory surgery as patients–consumers, third-party payers, and regulatory agencies place increasing demands for assessment of quality of medical care. Quality measures of outpatient surgery, which may include evaluation of postdischarge symptoms, must be developed in a methodologically rigorous fashion. In addition, assessment should not be burdensome so as to prevent implementation of these measures.

Evaluation of the Economic Impact of Postdischarge Symptoms

Despite the fact that the existing data suggest that postdischarge symptoms may interfere with patient recovery after outpatient surgery, the full economic effect of postdischarge symptoms is currently unknown. It is not clear what the impact of the presence (*vs.* absence) of a particular postdischarge symptom would be; however, the economic implications of a particular postdischarge symptom would be dependent on the incidence and impact of that symptom on any delays in resumption of normal activities. Proper economic analysis, including type of analysis (cost-effectiveness, cost–benefit, cost–utility), types of costs and benefits (direct and indirect, medical and nonmedical) and perspective for analysis (patient, provider, payer, societal),[57] is important to avoid any erroneous conclusions on the economic impact of postdischarge symptoms.

In general, studies demonstrating cost reduction resulting from substitution of outpatient for inpatient surgery measure only direct costs (payments made by third-party payers) but have not incorporated calculations for indirect costs.[10,58,59] Delayed recovery caused by the pres-

ence of postdischarge symptoms may increase both direct and indirect costs, which include delays in return to work, time taken off (for both the patient and caregiver), and opportunity lost. Indirect costs associated with postdischarge complications are not reimbursed by third-party payers, represent cost shifting to patients and their caregivers, and may result in underestimation of total healthcare costs if unaccounted for.[10,60] For instance, approximately 50% of caregiver–parents will take an unpaid day from work when accompanying their child for outpatient surgery.[61]

In fact, indirect costs may constitute a significant economic burden for caregivers providing informal care for nonhospitalized patients who may have either acute or chronic diseases.[62–66] Despite the lack of data connecting the presence of postdischarge symptoms after outpatient surgery to increases in cost at the individual or societal level, we do have examples of the economic impact of symptoms on indirect costs from other specialties.[65,66]

If subsequent investigations reveal that postdischarge symptoms do have a significant economic impact after outpatient surgery, then additional trials will be needed to determine if intraoperative[67] or postoperative[68] interventions can successfully be used to minimize postdischarge complications and improve patient recovery, including facilitation of earlier resumption of ADLs and employment, as interventions implemented for the prevention or treatment of acute medical conditions in an outpatient setting have the potential to decrease indirect costs such as caregiver work-loss costs.[69–71] In addition, development of newer longer-acting agents may attenuate the effects of postdischarge symptoms on patient recovery after outpatient surgery.[72] Finally, the cost-effectiveness of these interventions, including the willingness to pay,[73] should be examined.

In summary, postdischarge symptoms[11-17,74-95] are common after outpatient surgery. Presence of these symptoms may delay patient recovery after ambulatory surgery. The extent to which postdischarge symptoms increases the economic burden on patients, their caregivers, and society is not clear, and may represent a significant resource utilization issue at the individual and societal level. Anesthesiologists should take the lead in studying the impact of postdischarge symptoms and advocating for our patient's best care, even if it involves care beyond our traditional period of involvement.

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