

Natural history of abdominal pain in family practice

Longitudinal study of electronic medical record data in southwestern Ontario

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Abstract

Objective To examine the frequency, natural history, and outcomes of 3 subtypes of abdominal pain (general abdominal pain, epigastric pain, localized abdominal pain) among patients visiting Canadian family practices.

Design Retrospective cohort study with a 4-year longitudinal analysis.

Setting Southwestern Ontario.

Participants A total of 1790 eligible patients with International Classification of Primary Care codes for abdominal pain from 18 family physicians in 8 group practices.

Main outcome measures The symptom pathways, the length of an episode, and the number of visits.

Results Abdominal pain accounted for 2.4% of the 15,149 patient visits and involved 14.0% of the 1790 eligible patients. The frequencies of each of the 3 subtypes were as follows: localized abdominal pain, 89 patients, 1.0% of visits, and 5.0% of patients; general abdominal pain, 79 patients, 0.8% of visits, and 4.4% of patients; and epigastric pain, 65 patients, 0.7% of visits, and 3.6% of patients. Those with epigastric pain received more medications, and patients with localized abdominal pain underwent more investigations. Three longitudinal outcome pathways were identified. Pathway 1, in which the symptom remains at the end of the visit with no diagnosis, was the most common among patients with all subtypes of abdominal symptoms at 52.8%, 54.4%, and 50.8% for localized, general, and epigastric pain, respectively, and the symptom episodes were relatively short. Less than 15% of patients followed pathway 2, in which a diagnosis is made and the symptom persists, and yet the episodes were long with 8.75 to 16.80 months' mean duration and 2.70 to 4.00 mean number of visits. Pathway 3, in which a diagnosis is made and there are no further visits for that symptom, occurred approximately one-third of the time, with about 1 visit over about 2 months. Prior chronic conditions were common across all 3 subtypes of abdominal pain ranging from 72.2% to 80.0%. Psychological symptoms consistently occurred at a rate of approximately one-third.

Conclusion The 3 subtypes of abdominal pain differed in clinically important ways. The most frequent pathway was that the symptom remained with no diagnosis, suggesting a need for clinical approaches and education programs for care of symptoms themselves, not merely in the service of coming to a diagnosis. The importance of prior chronic conditions and psychological conditions was highlighted by the results.

Editor's key points

- ▶ This retrospective cohort study examined general, epigastric, and localized abdominal pain and explored the clinical pathways patients with each subtype of pain followed. Patient characteristics and health system factors associated with each pathway and subtype of pain were identified, although the small sample size may have led to missed predictive variables.
- ▶ For the vast majority of patients, the symptom episode lasted no longer than 1 or 2 visits. These results may support a watch-and-wait approach in the absence of red flags.
- ▶ Chronic disease diagnoses were common among those with abdominal pain. Although no associations between codes for prior psychological conditions and the outcome pathway followed in any of the 3 subtypes of abdominal pain were found, many patients (25.8% to 38.0%) had prior psychological conditions, and anxiety was a common diagnosis among patients with any of the 3 subtypes of abdominal pain.
- ▶ Abdominal pain symptoms lacking a diagnostic category are common in family practice. Research and medical education must investigate and employ symptom-based algorithms rather than focusing only on disease-centred topics, and approaches to undifferentiated or undiagnosed symptoms must be emphasized.

Points de repère du rédacteur

► Cette étude rétrospective de cohortes examinait la douleur abdominale générale, épigastrique et localisée, et explorait les trajectoires cliniques que suivaient les patients atteints de chaque sous-type de douleur. Les caractéristiques des patients et les facteurs du système de santé liés à chaque trajectoire et sous-type de douleur ont été déterminés, mais la petite taille de l'échantillonnage pourrait avoir fait en sorte que des variables prédictives soient passées inaperçues.

► Pour la grande majorité des patients, l'épisode des symptômes ne durait pas plus de 1 ou 2 visites. En l'absence de signaux d'alarme, ces résultats pourraient justifier une approche d'observation et d'attente.

► Les diagnostics de maladie chronique étaient courants parmi les personnes se plaignant de douleur abdominale. Bien qu'aucune association n'ait été observée entre les codes pour des problèmes psychologiques antérieurs et les trajectoires suivies dans l'un ou l'autre des 3 sous-types de douleur abdominale, de nombreux patients (de 25,8 à 38 %) avaient eu des problèmes psychologiques antérieurement, et l'anxiété était un diagnostic fréquent dans les 3 sous-types de douleur abdominale.

► Les symptômes de la douleur abdominale sans catégorie diagnostique sont courants en pratique familiale. La recherche et l'éducation médicale devraient étudier et utiliser des algorithmes fondés sur les symptômes au lieu de se concentrer seulement sur des sujets axés sur les maladies, et il faudrait insister sur des approches visant des symptômes indifférenciés ou non diagnostiqués.

L'évolution naturelle de la douleur abdominale en pratique familiale

Étude longitudinale des données de dossiers médicaux électroniques dans le sud-ouest de l'Ontario

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Résumé

Objectif Examiner la fréquence, l'évolution naturelle et les issues de 3 sous-types de douleur abdominale (douleur abdominale générale, douleur épigastrique, douleur abdominale localisée) chez des patients qui consultent dans des pratiques familiales canadiennes.

Type d'étude Une étude rétrospective de cohortes avec une analyse longitudinale sur 4 ans.

Contexte Le sud-ouest de l'Ontario.

Participants Au total, 1790 patients admissibles, dont les dossiers indiquaient des codes de la Classification internationale des soins primaires pour la douleur abdominale et traités par 18 médecins de famille dans 8 pratiques en groupe.

Principaux paramètres à l'étude Les trajectoires des symptômes, la durée d'un épisode et le nombre de visites.

Résultats La douleur abdominale était le motif de 2,4 % des 15 149 visites par les patients, et ce, chez 14,0 % des 1790 patients admissibles. La fréquence de chacun des 3 sous-types était la suivante : douleur abdominale localisée, 89 patients, 1,0 % des visites et 5,0 % des patients; douleur abdominale générale, 79 patients, 0,8 % des visites et 4,4 % des patients; et la douleur épigastrique, 65 patients, 0,7 % des visites et 3,6 % des patients. Les patients souffrant de douleur épigastrique ont reçu plus de médicaments, et ceux souffrant de douleur abdominale localisée ont subi plus d'investigations. Trois trajectoires des issues longitudinales ont été observées. La trajectoire 1, dans laquelle le symptôme demeurait sans diagnostic à la fin de la visite, était la plus fréquente chez les patients souffrant de l'un ou l'autre des sous-types de symptômes abdominaux, notamment dans 52,8 %, 54,4 % et 50,8 % des cas de douleur localisée, générale et épigastrique, respectivement, et les épisodes de symptômes étaient relativement courts. Moins de 15 % ont suivi la trajectoire 2, dans laquelle un diagnostic est posé et le symptôme persiste, et les épisodes duraient longtemps, notamment une durée moyenne variant de 8,75 à 16,80 mois et nécessitaient un nombre moyen de visites de 2,70 à 4,00. La trajectoire 3, dans laquelle un diagnostic est posé et aucune autre visite n'est nécessaire par la suite pour ce symptôme, s'est produite dans environ le tiers des cas, et représentait à peu près 1 visite sur environ 2 mois. Des problèmes chroniques antérieurs étaient fréquents dans les 3 sous-types de douleur abdominale, variant de 72,2 à 80,0 % des cas. Des symptômes psychologiques étaient souvent présents, dans une proportion d'environ le tiers.

Conclusion Les 3 sous-types de douleur abdominale différaient de manière cliniquement importante. La trajectoire la plus fréquente était que le symptôme était resté sans diagnostic, ce qui suggère la nécessité d'avoir des approches cliniques et des programmes de formation sur les soins pour les symptômes eux-mêmes, et pas seulement dans le but d'en arriver à un diagnostic. Les résultats ont mis en évidence l'importance des problèmes chroniques et psychologiques antérieurs.

Abdominal pain is a common symptom among patients presenting in family practice, representing an estimated 2.8% of consultations.¹ It presents considerable diagnostic challenges for practitioners; in the absence of alarming symptoms, it usually has a benign course but still may represent important, even life-threatening, pathology. Family physicians view abdominal symptoms as a source of diagnostic errors² and may undertake investigations to resolve the uncertainty. Despite this, a diagnosis is not made in 30% to 64% of cases.^{1,3,4} Nonspecific abdominal pain may become chronic, adversely affecting quality of life⁵ and employment.⁶ Given this background, Donner-Banzhoff et al⁷ called for more symptom-evaluating studies to gain knowledge on the risk of deterioration or likelihood of recovery to aid in prognosis.

The objective of this study was to examine the prevalence, natural history, and outcomes of 3 subtypes of abdominal pain in family practices. In the Canadian health care system, family physicians serve a gatekeeper function and their records are a rich source of data on patients' symptoms as they present in primary care.

— Methods —

This retrospective cohort study with a longitudinal analysis⁸ was conducted in 8 group practices of 18 family physicians in southwestern Ontario.

Data source

The de-identified electronic medical record database called the Deliver Primary Healthcare Information (DELPHI), located at the Centre for Studies in Family Medicine at Western University in London, Ont, has been described elsewhere.⁹ Physicians volunteered to code a random selection of 2 patients per day using International Classification of Primary Care (ICPC-2-R)¹⁰ coding. Recruitment ended after approximately 10% of the practice population had been selected; 3168 patients were followed prospectively from the inception of the database in October 2005 until June 30, 2010. A subset of these patients were included in this current study based on inclusion criteria.

As shown in **Figure 1**, for each patient visit, the patient's reason for the encounter (RFE) was coded, including 1 or more symptoms, a requested intervention, and pre-existing diagnoses. At the end of the visit, the physician coded unresolved symptoms, new unresolved symptoms, or 1 or more diagnoses.¹¹ More than 1 RFE and end-of-visit code could be applied to the same visit.⁹

Prior to the data collection period reported in this paper, family physicians participated in 4 hours of rigorous individual training (including tests using vignettes) and received a manual and ongoing support for the use of ICPC codes.

There are a variety of classification systems of abdominal pain depending on context and specialty,^{12,13} some

based on the cause¹⁴ and some on the location of the pain.¹⁵ The ICPC is a classification system that is well suited to family medicine: it incorporates the patient's presentation of their illness through the coding of RFEs including symptoms, and it enables the physician to describe the signs and symptoms prior to a definitive diagnosis. The ICPC¹⁰ is a topographic system. It provides 29 principal categories of bodily symptoms and diseases based on anatomic site. Three of these pertain to abdominal pain: ICPC code D01, abdominal pain or cramps, general, hereafter called *general abdominal pain*; ICPC code D02, abdominal pain, epigastric, hereafter called *epigastric pain*; and ICPC code D06, abdominal pain, localized, other, hereafter called *localized abdominal pain*.

Participant sample selection

Figure 2 outlines patient and visit inclusion. Inclusion criteria for patients were 18 years of age or older on July 1, 2006; visited between July 1, 2006, and June 30, 2010; had at least 1 RFE and at least 1 end-of-visit code; and had at least 1 year of visits before the first study visit date (ie, 1-year run-in time). The further criterion to be included in this study, not shown in **Figure 2**, was the presence of 1 of the top 3 ICPC codes indicating abdominal pain: general abdominal pain, epigastric pain, or localized abdominal pain. Patients were included only once for each symptom, and no patients appeared in more than 1 longitudinal episode. There was a wash-out period of at least 6 months after the last visit for the abdominal symptom. Patients were followed for a maximum of 4 years. All visits for the abdominal pain symptom were included.

This was a study of the natural history of abdominal pain *symptoms* as they present in family practice, not the natural history of a given *diagnosis*. An episode of pain was initiated when a patient presented with abdominal pain for the first time and ended when the symptom was no longer an RFE.

Outcome measures

The 3 outcome measures are defined in **Table 1***: symptom pathways, length of symptom episode, and the number of visits during a symptom episode.

The independent variables are defined in **Table 2**: patient demographic and clinical characteristics as well as health system impact variables.

Statistics

Frequencies of the 3 abdominal pain symptoms were identified.

Descriptive analyses created frequency distributions for the 3 outcomes, patient demographic and clinical characteristics, and health care impact (medications, laboratory

*Appendix A is available from <https://www.cfp.ca>. Go to the full text of the article online and click on the **CFPlus** tab.

Figure 1. ICPC coding at each visit

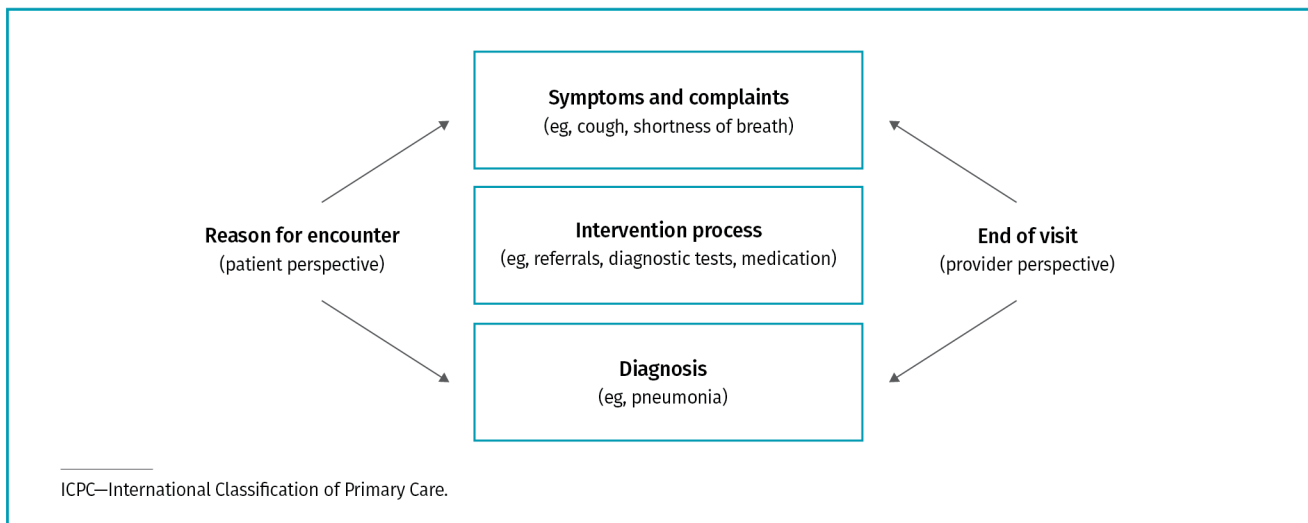
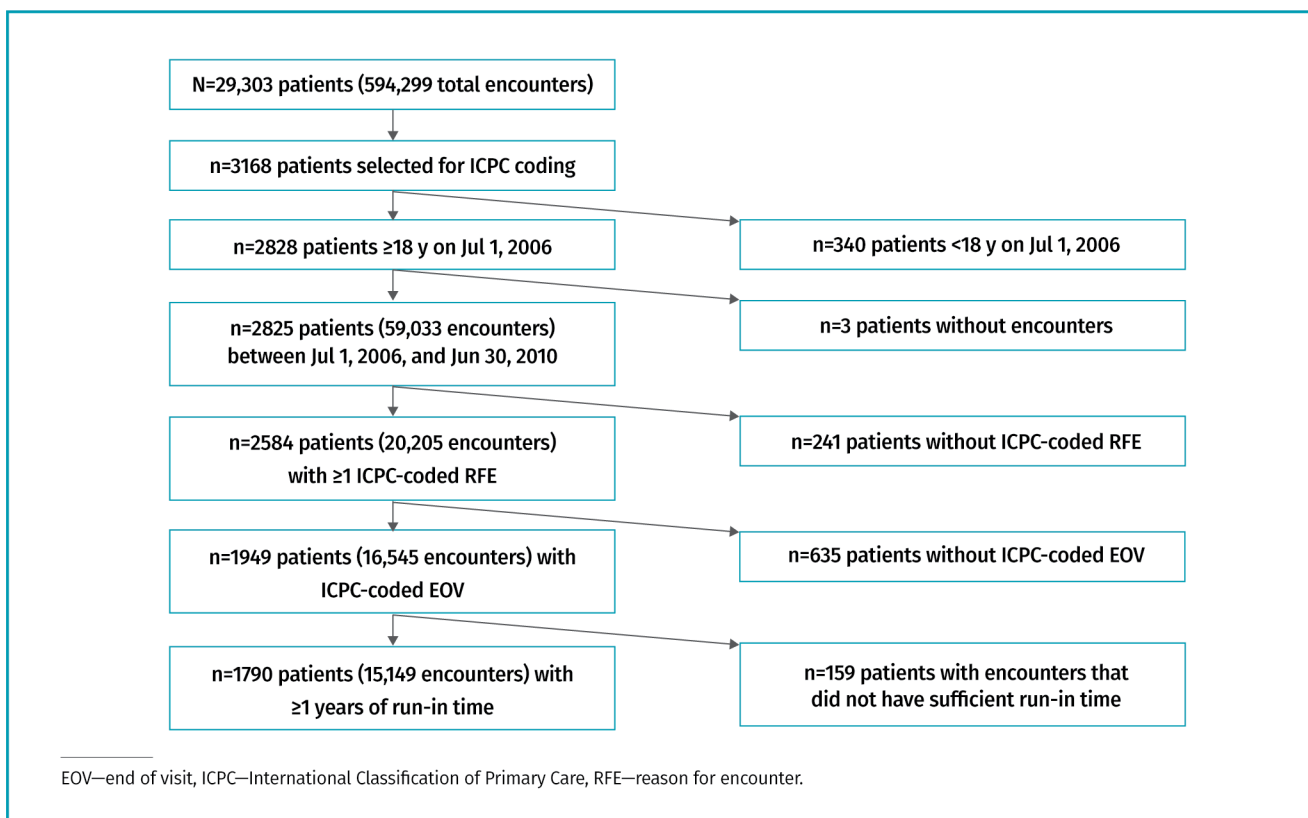


Figure 2. Flow chart of sample selection



tests, investigations, and referrals). Differences in the outcomes and the independent variables among the 3 subtypes of abdominal pain subtypes were tested using ANOVA (analysis of variance) and χ^2 testing as appropriate.

Further, it was decided that, should differences be found among the abdominal pain subtypes, analyses would be conducted within subtypes to examine the relationship between the outcomes and the patient and clinical care variables. Additionally, for the symptom pathway

outcome, it was decided that only bivariate analyses (using χ^2 and ANOVA as appropriate) would be run, given the small number of patients in each of the 3 categories of this outcome. For the other 2 outcomes—length of episode and number of visits—bivariate analyses would be run and variables statistically significant in the bivariate analysis would then be entered into a multivariate analysis using a negative binomial regression. Adjusting for clustering of patients within practices was attempted

Table 1. Outcome variables

VARIABLE	DESCRIPTION
First outcome: symptom pathways*	
• Pathway 1	Symptom remains with no diagnosis: the abdominal symptom was not classifiable into a known diagnostic category and persisted as a continued RFE
• Pathway 2	Diagnosis [†] made and symptom persists: a symptom was placed in a diagnostic category but it continued as an RFE at subsequent visits until there was a washout period of 6 mo with no visits for the symptom
• Pathway 3	Diagnosis made, and no further visits for the symptom: a diagnosis was made after which there were no further visits with that symptom as the RFE
Second outcome: length of symptom episode, mo	No. of mo between the first and last visits for the symptom Patients with only 1 visit for a symptom had 0 mo with the symptom. A <i>symptom episode</i> was defined as the time between the first presentation of the symptom until it was no longer an RFE
Third outcome: no. of visits during a symptom episode	No. of visits between the first and last visits for the symptom as an RFE
RFE—reason for encounter. *See Appendix A (available from CFPlus *) for details of the classification process to result in the 3 pathways. †For the 3 abdominal pain subtypes, if a diagnosis was coded at the end of the visit it was categorized by 2 clinician investigators (T.R.F., D.L.) as either being relevant to the abdominal pain subtype or not. Both clinicians coded the list of end-of-visit codes separately, and then came to an agreement through discussion.	

Table 2. Independent variables

VARIABLE	DESCRIPTION
Patient demographic and clinical characteristics	
• Sex and age	Patient sex (male or female) and age in y (as of the date of the first study visit) were recorded
• Presence of prior psychological conditions (yes or no)	All ICPC end-of-visit codes in the y prior to the first study visit for the abdominal symptom were used to identify whether the patient had 1 or more psychological conditions in the <i>P</i> or <i>psychological</i> chapter of ICPC
• Presence of prior chronic conditions (yes or no)	All ICPC-coded diagnoses in the database prior to the first study visit were used to identify whether the patient had any chronic condition diagnoses prior to the first encounter for an abdominal pain symptom. Diagnoses were classified as chronic conditions using a list of 98 clinician-identified chronic condition diagnoses (personal communication; H. Lamberts, I. Okkes; January 2005). The frequencies of individual chronic conditions were identified
Health system impact variables	
• Medication prescriptions issued (yes or no)	Prescriptions for medications issued subsequent to the first visit for the symptom were identified until the end of the washout period
• Laboratory tests ordered (yes or no)	Laboratory tests ordered were identified at all the visits under study
• Investigations (yes or no)	Investigations including x-ray scans and other imaging were identified at all the visits under study
• Referrals made (yes or no)	No. of referrals to medical specialists were identified until the end of the washout period
ICPC—International Classification of Primary Care.	

for the bivariate analyses, but failed to be computed in most instances, likely owing to small sample size.

— Results —

The sample, found at the bottom of **Figure 2**, included 15,149 ICPC-coded physician visits from 1790 eligible patients of 18 physicians at 8 practice sites. Overall, abdominal pain accounted for 2.4% of the 15,149 visits and involved 14.0% of the 1790 patients in this study, making it the third most frequent symptom presenting as an RFE. The 3 most common abdominal symptoms in order of frequency were localized abdominal pain (89 patients, 1.0% of visits, 5.0% of patients), general abdominal pain (79 patients, 0.8% of visits, 4.4% of patients), and epigastric pain (65 patients, 0.7% of visits, 3.6% of patients).

The 3 subtypes of abdominal pain are compared in **Table 3**. In terms of outcomes, there were no statistically significant differences among the 3 subtypes of abdominal pain with respect to the proportions of people in the 3 different pathways, the mean length of episode, and the number of visits for the symptom. With respect to patient characteristics and clinical care, there were no significant differences among the 3 subtypes of abdominal pain in terms of age, sex, proportions of patients with prior psychological conditions, proportions of patients receiving laboratory tests, or proportions of patients receiving referrals. Medications were prescribed significantly more often for patients

presenting with epigastric pain ($P=.04$). The differences among the 3 pain subtypes with respect to medications and investigations suggested the need to further study each of the 3 subtypes of abdominal pain separately.

Localized abdominal pain. **Table 4** summarizes the results for 89 patients presenting with localized abdominal pain. Of these 89 patients, a slight majority (52.8%) were in pathway 1 (symptom remains with no diagnosis); 13.5% were in pathway 2 (diagnosis made and symptom persists); and 33.7% were in pathway 3 (diagnosis made and no further visits for the symptom). Comparing patients in the 3 pathways, there were no differences in age, sex, proportions of patients with prior psychological conditions, or proportions of patients with prior chronic conditions; there were, however, significant differences in mean length of episode ($P<.001$), mean number of visits ($P<.001$), proportions of patients being prescribed medications ($P=.028$), and proportions of patients receiving referrals ($P=.017$). In pathway 2, the most common diagnoses were constipation, cholecystitis, back syndrome without radiating pain, and anxiety. Pathway 2 had the longest mean length of episode (8.75 months), highest mean number of visits (3.33), and the highest proportions of patients receiving medications (91.7%) and referrals (66.7%). In pathway 3, the most common diagnoses were back syndrome without radiating pain, constipation, esophageal disease, inguinal hernia, abdominal hernia, and diverticular disease. Multivariate analysis of factors related to episode length

Table 3. Comparison of 3 subtypes of abdominal pain on outcome pathways, episode length, patient demographic and clinical characteristics, and health care impact variables

VARIABLE	LOCALIZED ABDOMINAL PAIN (n=89)	GENERAL ABDOMINAL PAIN (n=79)	EPIGASTRIC PAIN (n=65)	TEST, P VALUE
Three outcome categories,* n (%)				
• Pathway 1	47 (52.8)	43 (54.4)	33 (50.8)	$\chi^2_4=1.56$ $P=.82$
• Pathway 2	12 (13.5)	7 (8.9)	10 (15.4)	
• Pathway 3	30 (33.7)	29 (36.7)	22 (33.8)	
Total	89 (100.0)	79 (100.0)	65 (100.0)	
Mean length of symptom episode, mo	2.40	1.90	2.03	$F=0.374$; $P=.688$
Mean no. of visits during a symptom episode	1.55	1.46	1.40	$F=0.169$; $P=.845$
Mean age, y	56.34	60.49	57.63	$F=1.081$; $P=.341$
Female sex, n (%)	59 (66.3)	52 (65.8)	47 (72.3)	$\chi^2_2=0.84$; $P=.66$
Prior psychological conditions, n (%)	23 (25.8)	30 (38.0)	19 (29.2)	$\chi^2_2=3.0$; $P=.22$
Prior chronic conditions, n (%)	67 (75.3)	57 (72.2)	52 (80.0)	$\chi^2_2=1.19$; $P=.551$
Prescribed medications, n (%)	55 (61.8)	45 (57.0)	50 (76.9)	$\chi^2_2=6.61$; $P=.04$
Received investigations, n (%)	39 (43.8)	19 (24.1)	25 (38.5)	$\chi^2_2=7.45$; $P=.02$
Received laboratory tests, n (%)	12 (13.5)	5 (6.3)	6 (9.2)	$\chi^2_2=2.45$; $P=.294$
Received referrals, n (%)	28 (31.5)	22 (27.8)	14 (21.5)	$\chi^2_2=1.87$; $P=.39$

*Pathway 1—symptom remains with no diagnosis; pathway 2—diagnosis made and symptom persists; pathway 3—diagnosis made and no further visits for the symptom.

Table 4. Comparison among the 3 pathways of patient demographic and clinical characteristics, length of episode, no. of visits, and health care impact variables for localized abdominal pain: *N*=89.

VARIABLE	PATHWAY 1* n=47 (52.8%)	PATHWAY 2* n=12 (13.5%)	PATHWAY 3* n=30 (33.7%)
Mean age, y	55.30	59.92	56.53
Female sex, n (%)	29 (61.7)	10 (83.3)	20 (66.7)
Prior psychological conditions, n (%)	10 (21.3)	4 (33.3)	9 (30.0)
Prior chronic conditions, n (%)	33 (70.2)	9 (75.0)	25 (83.3)
No. of visits, n (%)			
• 1	40 (85.1)	0 (0.0)	23 (76.7)
• 2	4 (8.5)	4 (33.3)	5 (16.7)
• ≥3	3 (6.4)	8 (66.7)	2 (6.7)
Mean length of episode, mo <i>P</i> <.001†	1.02	8.75	2.03
Mean no. of visits <i>P</i> <.001†	1.26	3.33	1.30
Common diagnoses	NA	Constipation Cholecystitis Back syndrome without radiating pain Anxiety	Back syndrome without radiating pain Constipation Esophageal disease Inguinal hernia Abdominal hernia Diverticular disease
Prescribed medications, n (%) <i>P</i> =.028‡	24 (51.1)	11 (91.7)	20 (66.7)
Received investigations, n (%)	20 (42.6)	7 (58.3)	12 (40.0)
Received laboratory tests, n (%)	6 (12.8)	4 (33.3)	2 (6.7)
Received referrals, n (%) <i>P</i> =.017‡	13 (27.7)	8 (66.7)	7 (23.3)

NA—not applicable.
*Pathway 1—symptom remains with no diagnosis; pathway 2—diagnosis made and symptom persists; pathway 3—diagnosis made and no further visits for the symptom.
†Tested using ANOVA (analysis of variance).
‡Tested using χ^2 test.

and number of visits found that those in pathways 2 and 3 tended to have longer episode lengths than those in pathway 1 ($\beta=2.143$, $P<.1$; $\beta=1.009$, $P=.002$, respectively). Also, laboratory tests were ordered less frequently the longer the episode length ($\beta=-1.072$, $P=.011$). The mean number of visits was significantly higher among patients in pathway 2 ($\beta=0.884$, $P=.037$).

General abdominal pain. Seventy-nine patients with an initial presentation of general abdominal pain were followed (Table 5). The majority of these cases (54.4%)

fell into pathway 1, and in 97.7% of those, no more than 2 visits were made. Only 8.9% were in pathway 2 and the remaining 36.7% fell into pathway 3. There were statistically significant differences among the 3 outcome pathways in episode length ($P<.001$), mean number of visits ($P<.001$), proportions of patients being prescribed medications ($P=.031$), and proportions of patients receiving referrals ($P=.002$). Pathway 2 had the longest mean episode length (16.86 months), the highest mean number of visits (4.00), and the highest proportions of patients receiving medications (85.7%) and

Table 5. Comparison among the 3 pathways of patient demographic and clinical characteristics, length of episode, no. of visits, and health care impact variables for general abdominal pain: N=79 patients.

VARIABLE	PATHWAY 1* n=43 (54.4%)	PATHWAY 2* n=7 (8.9%)	PATHWAY 3* n=29 (36.7%)
Mean age, y	62.09	60.86	58.03
Female sex, n (%)	30 (69.8)	5 (71.4)	17 (58.6)
Prior psychological conditions, n (%)	15 (34.9)	5 (71.4)	10 (34.5)
Prior chronic conditions, n (%)	30 (69.8)	7 (100.0)	20 (69.0)
No. of visits, n (%)			
• 1	36 (83.7)	0 (0.0)	26 (89.7)
• 2	6 (14.0)	2 (28.6)	2 (6.9)
• ≥3	1 (2.3)	5 (71.4)	1 (3.4)
Mean length of episode, mo <i>P</i> <.001†	0.49	16.86	0.38
Mean no. visits <i>P</i> <.001†	1.26	4.00	1.14
Common diagnoses	NA	Irritable bowel syndrome (50.0%) Anxiety	Diverticular disease (26.5%) Constipation GI infection
Prescribed medications, n (%) <i>P</i> =.031‡	19 (44.2)	6 (85.7)	20 (69.0)
Received investigations, n (%)	8 (18.6)	2 (28.6)	9 (31.0)
Received laboratory tests, n (%)	3 (7.0)	0 (0.0)	2 (6.9)
Received referrals, n (%) <i>P</i> =.002‡	9 (20.9)	6 (85.7)	7 (24.1)
GI—gastrointestinal, NA—not applicable. *Pathway 1—symptom remains with no diagnosis; pathway 2—diagnosis made and symptom persists; pathway 3—diagnosis made and no further visits for the symptom. †Tested using ANOVA (analysis of variance). ‡Tested using χ^2 test.			

being referred (85.7%). The most common diagnoses in this pathway were irritable bowel syndrome and anxiety. Turning to pathway 3, the most common diagnoses were diverticular disease, constipation, and gastrointestinal (GI) infection, and by far most patients (96.6%) made no more than 2 visits. Multivariate analysis of factors related to episode length and number of visits found shorter episodes for male patients ($\beta=-1.055$, $P=.043$). Longer episodes were found among patients in pathway 2 ($\beta=3.496$, $P<.001$) and those patients having referrals ($\beta=1.893$, $P<.001$). A higher mean number of visits was associated with being in pathway 2 ($\beta=1.039$, $P=.043$).

Epigastric pain. Sixty-five patients were followed after their initial presentations with epigastric pain (Table 6). The majority (50.8%) fell into pathway 1, the smallest proportion (15.4%) were in pathway 2, and one-third (33.8%) fell into pathway 3. There were significant differences among these 3 groups in terms of

prior chronic conditions ($P=.002$), mean length of episode ($P<.001$), mean number of visits ($P<.001$), and proportions of patients being prescribed medications ($P=.025$). Patients in pathway 2 showed the lowest proportion of patients with prior chronic conditions, the longest mean episode length (10.10 months), the highest mean number of visits (2.70), and the highest proportion receiving medications (100.0%). The most common diagnoses in this group were anxiety, GI infection, and peptic ulcer. The most common diagnoses for patients in pathway 3 were esophageal disease, anxiety, and stomach function disorder. None of the patients in pathway 3 made more than 2 visits. Multivariate analyses indicated that episode length was longer for male patients ($\beta=3.754$, $P<.001$), longer for pathway 2 ($\beta=5.482$, $P<.001$), and longer the younger the age of the patient ($\beta=-0.093$, $P<.001$). A higher number of visits was also associated with being in pathway 2 ($\beta=0.865$, $P=.053$).

Table 6. Comparison among the 3 pathways of patient demographic and clinical characteristics, length of episode, no. of visits, and health care impact variables for epigastric pain: *N*=65.

VARIABLE	PATHWAY 1* n=33 (50.8%)	PATHWAY 2* n=10 (15.4%)	PATHWAY 3* n=22 (33.8%)
Mean age, y	55.64	59.30	59.86
Female sex, n (%)	22 (66.7)	8 (80.0)	17 (77.3)
Prior psychological conditions, n (%)	7 (21.2)	3 (30.0)	9 (40.9)
Prior chronic conditions, n (%) <i>P</i> =.002†	28 (84.8)	4 (40.0)	20 (90.9)
No. of visits, n (%)			
• 1	30 (90.9)	0 (0.0)	21 (95.5)
• 2	1 (3.0)	5 (50.0)	1 (4.5)
• ≥3	2 (6.1)	5 (50.0)	0 (0.0)
Mean length of episode, mo <i>P</i> <.001‡	0.94	10.10	0.00
Mean no. of visits <i>P</i> <.001‡	1.24	2.70	1.05
Common diagnoses	NA	Anxiety GI infection Peptic ulcer	Esophageal disease (28.0%) Anxiety Stomach function disorder
Prescribed medications, n (%) <i>P</i> =.025†	27 (81.8)	10 (100.0)	13 (59.1)
Received investigations, n (%)	13 (39.4)	6 (60.0)	6 (27.3)
Received laboratory tests, n (%)	4 (12.1)	1 (10.0)	1 (4.5)
Received referrals, n (%)	4 (12.1)	3 (30.0)	7 (31.8)

GI—gastrointestinal, NA—not applicable.
 *Pathway 1—symptom remains with no diagnosis; pathway 2—diagnosis made and symptom persists; pathway 3—diagnosis made and no further visits for the symptom.
 †Tested using χ^2 test.
 ‡Tested using ANOVA (analysis of variance).

— Discussion —

There were 4 key findings from this research: 1) This is the first study we are aware of that compared the outcomes, over time, of 3 subtypes of abdominal pain defined in ICPC-2-R. 2) We found that for all 3 subtypes of abdominal pain, patients could be categorized as following 1 of 3 pathways: pathway 1, symptom remains with no diagnosis; pathway 2, diagnosis made and symptom persists; or pathway 3, diagnosis made and no further visits for the symptom. 3) In at least half of patients presenting with abdominal pain, no diagnoses were made. 4) Prior chronic diseases were very common and prior psychological conditions were also common among patients presenting with abdominal pain.

Comparison among subtypes of abdominal pain. Our study findings support the differentiation of abdominal pain found in the ICPC-2-R categories rather than

a more generic label such as “abdominal pain not yet diagnosed” found in most of the primary care literature. When a diagnostic label was possible, the 3 subtypes of abdominal pain were quite different, but the numbers were too small to test for statistical significance.

Three pathways over time. We described 3 longitudinal pathways of the patients’ symptoms. Others examining abdominal pain over time have also observed pathways or trajectories. Rao et al,¹⁶ in studying the diagnostic process in abdominal pain using an electronic health record database, defined 3 diagnostic pathways, one of which was lack of a diagnosis, similar to our findings. Our second pathway of continued visits even after diagnosis may represent a working diagnosis group, as it could be argued that the increased use of tests and investigations, as we found, might reflect diagnostic uncertainty on the part of the physician and that the diagnostic labels applied were provisional. Working

or provisional diagnoses are a reality of family practice and have been commented upon by others.^{3,17,18}

No diagnosis was made. Symptoms lacking a diagnostic category are common in family practice.¹⁹ Regarding abdominal pain in primary care, Klinkman³ found no diagnosis was reached in 51% of cases, similar to our findings. Further, his outcomes of average length of episode at 1.32 visits and 76% of episodes requiring only a single visit are similar to our findings for patients in pathways 1 and 3. He also found a statistically significant relationship between resource use (tests, investigations, referrals) and physician-perceived complexity and uncertainty. Our results indicate that it is a minority of individuals presenting with abdominal pain who require increased health care resources.

Prior chronic diseases were common. We found that presence of chronic diagnoses was very common among those with abdominal pain. Abdominal pain must be seen, clinically, in the context of multimorbidity and the attendant polypharmacy. It has also been recognized that there is considerable overlap in patients with chronic non-malignant abdominal pain and those with disorders labelled *functional*⁴ and those with histories of sexual abuse.²⁰⁻²⁴ We did not find an association between the presence of codes for prior psychological conditions and the outcome pathway followed in any of the 3 subtypes of abdominal pain we examined, although a robust proportion of patients (25.8% to 38.0%) had prior psychological conditions, and anxiety was a common diagnosis in all 3 subtypes of abdominal pain. This speaks to the importance of psychological stress in the manifestation of abdominal pain. Advances in psychoneuroimmunology¹³ make it clear that the symptom of abdominal pain represents the interface of the biological, psychological, and social world of the patient.

Some variables we chose for this study were not predictive of outcome. While this may reflect the small sample sizes, there also may be other patient characteristics that are important in determining whether a symptom persists and becomes chronic. Physicians may have some insight into what pathway a symptom may take in an individual patient known to them. Some have found that the physician's impression that "something is wrong" is the best predictor of serious illness.^{25,26}

Clinical implications. It is noteworthy that for all 3 subtypes of abdominal pain, in the vast majority of patients the symptom episode was no longer than 1 or 2 visits. These results may support a watch-and-wait approach in the absence of red flags such as weight loss or GI bleeding. Family physicians serve an important function in protecting patients from overinvestigation and saving the health care system from excessive costs in

tests, investigations, and referrals. For each subtype of abdominal pain, there was a pathway in which, despite having a diagnosis, patients continued to consult their physicians about the symptom, often over many months. In this pathway there may be patients for whom the diagnosis was incorrect or for whom the diagnosis was accurate but effective therapies are elusive (eg, irritable bowel syndrome).

Research implications. Our results need to be validated in other settings. The relationship between abdominal pain and multimorbidity deserves attention. Further longitudinal research is needed to define the prognosis of abdominal pain symptoms, particularly for the minority of patients in whom abdominal pain takes a chronic course.²⁷ Future research on abdominal pain in family practice should use the subtypes described in the latest version of ICD-10.

Educational implications. Formal medical education on disease-centred topics needs to be complemented by symptom-based algorithms and approaches to undifferentiated or undiagnosed symptoms to help properly care for these patients and to avoid unnecessary interventions and potential iatrogenic harm.

Limitations

This study was based on data from family practices in southwestern Ontario and may not be generalizable to other areas. However, the DELPHI practice populations were demographically similar to the Canadian population,²⁸ and many of the findings are consistent with those of symptom studies done in the United States.^{3,16}

Our study involved small numbers of patients and multiple independent variables. Small sample sizes limited our ability to conduct more sophisticated analyses such as adjusting for the clustering of patients in practices. Forty bivariate tests of significance led to very few independent variables being included in the multivariate tests. Therefore, larger studies are needed. We limited our study to patients 18 years of age or older. Pediatric abdominal pain was outside the scope of this study.


The data are from 2005 to 2010. However, many of the findings are consistent with those of other studies. While therapies may have changed in the ensuing decade, it is unlikely that prevalence and presence or absence of diagnoses will have changed.

Our follow-up period was 4 years, which is both a strength and a limitation. Serious diagnoses were rare. We are not able to conclude that malignancies and other severe maladies might not become evident with longer follow-up.

Health system impact may go beyond what we were able to measure, as emergency department visits and hospitalizations are not consistently recorded in family practice electronic medical records. In terms of visits, investigations, and referrals, our figures should be considered underestimates.

This study focused on the natural history of abdominal pain from the perspective of family practice and does not reflect patients' subjective experiences of abdominal pain.

Conclusion

The 3 subtypes of abdominal pain were clinically distinguishable. For all 3, in more than 50% of cases no diagnostic label was applied. Three prognostic pathways were found suggesting that further research and education is needed on the natural history of symptoms as symptoms, not only as clues to a diagnosis. The importance of prior chronic conditions and psychological conditions were highlighted in the results. 

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Contributors

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Competing interests

None declared

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