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Occurrence of arrhythmias in general practice

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Objective **– To study the occurrence and distribution of arrhythmias in patients with symptoms possibly caused by arrhythmias, in order to support the diagnostic process in general practice.**
Design **– From 1989-1991 all patients who consulted their general practitioner with symptoms or signs possibly indicating an arrhythmia had a transtelephonic electrocardiogram, which was sent to the Department of Cardiology for interpretation.**
Setting **– 20 Dutch general practices, serving a population of nearly 50 000 inhabitants.**
Subjects **– A total of 868 patients were included in the study.**
Results **– An arrhythmia was documented by ECG in 32% of the patients. Of these, 31% clinically more relevant arrhythmias needed medical attention. An incidence of 2.6 arrhythmias per 1000 listed patients was calculated. There was a highly positive correlation between the occurrence of arrhythmias and age. Relatively more arrhythmias were seen in men, in patients with occasional findings, and when there were symptoms that possibly indicated haemodynamic imbalance.**
Conclusion **– Clinically relevant arrhythmias can be detected in general practice with 12-lead ECG recording in a significant proportion of patients with symptoms and physical findings suggesting an arrhythmia. The distribution of arrhythmias described in this study can help general practitioners in their diagnostic management.**

Key words: **arrhythmia, epidemiology, incidence, general practice.**

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Patients with symptoms that may be caused by arrhythmias are frequently seen in general practice. It is unclear to what extent such symptoms are caused by distinct arrhythmias, and how far they can be detected. General practitioners (GPs) in The Netherlands do not make ECG recordings routinely in these patients. Their management is largely based on an estimation of chance, whether an arrhythmia is present or absent. GPs do not like to use superfluous diagnostics and do not want to misdiagnose a relevant arrhythmia. However, the literature reveals virtually no data about the occurrence of distinct arrhythmias in general practice, nor quantitative information about the likelihood that an arrhythmia can be found in patients with such symptoms. Froom and Froom (1) described only electrocardiographic abnormalities in primary care patients during a one-year period, not focused on arrhythmias. By contrast, the incidences and prevalences of arrhythmias in selected working populations (2-4) and in the community (4-8) are well known. These studies

are of little practical importance for GPs since arrhythmias do not always result in a consultation, and the diagnostic and prognostic value of clinical findings in patients may depend on the selected population (2,4,9). Besides, many of the population-based studies have been done with 24-hour ambulatory ECG, and there is poor correlation between arrhythmias detected by long-term ECG and a standard 12-lead ECG (3,8,10). Data about the occurrence of arrhythmias are of utmost importance for the GP because his diagnostic procedure is based on the prior probability of the occurrence (11). The existing Dutch registration networks do not give an extensive specification of the arrhythmias in general practice and use a classification which is not commonly used in clinical practice (12-15). The distribution of the distinct arrhythmias is meaningful for the risk stratification of cardiovascular morbidity. For GPs it is important to know whether they can properly reassure or treat the patients or whether they should refer them to a cardiologist. Because the prior probability is very important in the diagnostic process and in the differentiation between innocent and severe arrhythmias, we studied the occurrence of arrhythmias in general practice, and associations between arrhythmias and patient characteristics and medical history. The patients in our study had symptoms or coincidental findings possibly indicating an arrhythmia. Arrhythmias were detected with 12-lead recordings, equipment usually available in general practice.

Methods

From 1989-1991 27 Dutch GPs from 20 practices in Maastricht and the direct surroundings (total population of nearly 50 000 patients) participated in the study. There is only one hospital in the region, the Academic Hospital Maastricht; it collaborates with all the GPs. The mean duration of participation of practices was 22.6 months (range 3-26 months). Patients consulting their GP because of palpitations were enrolled. In addition, patients presenting with dyspnoea, vertigo, angina pectoris, fatigue, syncope and other symptoms were included, when the GP suspected that an arrhythmia was the cause of the symptoms. Furthermore, patients were included when an abnormal rhythm was found coincidentally during a consultation, e.g. an irregular pulse or heart beat, a rate of more than 100 or less than 60 beats per minute, or five or more extrasystoles per minute. Presenting symptoms and coincidental findings had to be new for the GP or should represent a diagnostic problem. Patients were excluded as follows: age less than 15 years; fever; unsuccessful ECG recording or loss of research forms; participation inconsistent with good practice, e.g. patients with acute myocardial infarction or circulatory arrest. Patients who visited the emergency department of the hospital during the same period because of arrhythmias were registered. Registration and hospital charts were compared to check whether patients from the participating GPs were not included, incorrectly.

Transtelephonic ECGs from all the included patients were sent to the Department of Cardiology of the hospital. Patients who did not have symptoms during a consultation were asked to come back for an ECG when symptoms occurred. If more than one ECG was available, the one taken when the patient had symptoms was used for analysis. The transtelephonic ECG recordings were obtained by an ECG modem 3 (Cardio Control BV, Rijswijk, The Netherlands), consisting of a 12-lead ECG taken during 36 seconds.

The interpretation of the ECGs was done by a cardiologist trainee and checked by a senior cardiologist; they were unaware of the findings of the medical history and physical examination. When extrasystoles were present on the ECG in combination with a rhythm other than a sinus rhythm, the ECG was interpreted as the leading rhythm and no attention was paid to the extrasystoles.

GPs had to fill out the research forms before receiving the interpretation of the ECG. The GPs' registration system was used to collect patients' medical history data. Chi-square tests for independent proportions and linear trend were used in the statistical analysis.

Results

A total of 878 patients met the inclusion criteria. Ten were excluded because the ECG recordings or the research forms were lost. During the study period, seven patients from the participating GPs who were not under cardiologist supervision and were not previously known to have an arrhythmia,

Table I. Reasons for inclusion of the patients studied and arrhythmias detected.

	Patients		Arrhythmias detected	
	n	(%)*	n	%**
Presenting symptoms				
Palpitations	557	(64.2)	138	24.8
Angina pectoris	138	(15.9)	34	24.6
Vertigo	76	(8.8)	35	46.1
Dyspnoea	67	(7.7)	33	49.3
Fatigue	40	(4.6)	15	37.5
Collapse	22	(2.5)	13	59.1
Other	22	(2.5)	4	18.2
Subtotal	762	(87.8)	215	28.2
Occasional findings				
Irregular pulse and or heart action	46	(5.3)	31	67.4
Pulse rate and or heart rate >100	42	(4.8)	20	47.6
Pulse rate and or heart rate <60	10	(1.2)	8	80.0
≥5 extrasystoles	14	(1.6)	11	78.6
Subtotal	106	(12.2)	65	61.3
Total	868	(100.0)	280	32.3

* Column percentage exceeds 100% because patients could be included on more than one symptom.
** Row percentages.

visited the emergency department of the hospital with a rather serious arrhythmia and were incorrectly not enrolled in the study: four had atrial fibrillation, two AV-nodal tachycardia and one atrial flutter. Of the 868 remaining patients, 794 were seen at the GPs' surgery and 74 during home visits. Of the latter, 12 visits were emergency cases. In 75% of the cases a new symptom or coincidental finding was the reason for including patients; in the remainder the GP had a diagnostic problem in a patient known to have an arrhythmia. Most of the patients (n=762) were enrolled because of specific symptoms, the remainder (n=106) because of coincidental findings (Table I). One hundred and nineteen patients (14%) were included on more than one symptom or finding. GPs succeeded in making an ECG recording while they had specific symptoms or signs in 36% of the cases. Most of the included patients (63%) were women.

An arrhythmia was detected in nearly one third of the cases. The same arrhythmia was detected in only 27% of the patients who were known to have an arrhythmia. Taking participation time and practice size into account, an overall incidence of 2.6 (SD 1.6), and incidences of 2.2 (SD 1.6) and 2.9 (SD 1.9) arrhythmias per 1000 listed men and women per year, respectively, were calculated. An arrhythmia was detected in 48% of the patients who had specific symptoms during the ECG, and in 19% without symptoms at the recording. Of the patients who were included because of coincidental findings, an arrhythmia was found in 81% with signs during recording and in 7% without signs. The majority of the patients (64%) were included because of palpitations. An arrhythmia was found, depending on the inclusion criteria, in 48-80% of the patients who were included because of occasional findings and in 18-59% of the patients who were included because of symptoms. An arrhythmia was detected in nearly half of the patients who were suspected by the GP of having an arrhythmia based on symptoms possibly caused by haemodynamic imbalance, e.g. vertigo, dyspnoea, fatigue, and collapse.

About one fifth of the patients had a history of high blood pressure and 17% were known to have hyperventilation; one third of the patients had no relevant medical history (Table II). A positive history of coronary disease, myocardial infarction, heart failure, and chronic obstructive pulmonary disease (COPD) was significantly more frequent ($p<0.01$) in men, while more women had a history of hyperventilation ($p<0.05$).

Table II. Medical history in patients with symptoms or physical findings suggesting an arrhythmia, by sex.[1]

Medical history	Men n (%)	Women n (%)	OR (95% CI)	Total n (%)
Coronary disease	31 (9.6)	22 (4.0)	2.54 (1.39- 4.63)**	53 (6.1)
Myocardial infarction	17 (5.3)	6 (1.1)	5.02 (1.86-15.68)**	23 (2.7)
Valve disorder	5 (1.6)	12 (2.2)	0.70 (0.21-2.17)	17 (2.0)
Arrhythmia	33 (10.2)	45 (8.3)	1.27 (0.77-2.09)	78 (9.0)
Heart failure	14 (4.3)	13 (2.4)	2.76 (1.20-6.36)**	27 (3.1)
Conduction disturbances	1 (0.3)	1 (0.2)	1.70 (0.02-133.5)	2 (0.2)
Hypertension	66 (20.6)	114 (21.0)	0.98 (0.69-1.39)	180 (20.8)
Orthostatic hypotension	3 (0.9)	11 (2.0)	0.46 (0.08-1.75)	14 (1.6)
COPD	36 (11.2)	24 (4.4)	2.74 (1.55-4.84)**	60 (6.9)
Neurological disease	26 (8.1)	30 (5.5)	1.51 (0.85-2.69)	56 (6.5)
Ear disease	9 (2.8)	19 (3.5)	0.80 (0.33-1.88)	28 (3.2)
Diabetes mellitus	11 (3.4)	15 (2.8)	1.25 (0.53-2.93)	26 (3.0)
Psychiatric illness	21 (6.5)	29 (5.3)	1.23 (0.67-2.30)	50 (5.8)
Hyperventilation syndrome	42 (13.0)	108 (19.8)	0.61 (0.41-0.92)*	150 (17.3)
Other	70 (21.7)	109 (20.0)	1.11 (0.78-1.58)	179 (20.6)
Positive medical history	207 (64.3)	342 (62.6)	1.07 (0.80-1.44)	549 (63.2)
Total	322 (100.0)	546 (100.0)		868 (100.0)

[1] Column percentage exceeds 100% because patients could have more than one known disease.
* $p<0.05$
** $p<0.01$

Table III. Arrhythmias detected in patients with symptoms or physical findings suggesting an arrhythmia, by age and sex (n=868).

Age group	Patients			Arrhythmias detected			% Arrhythmias		
	Both sexes	Men	Women	Both sexes	Men	Women	Both sexes	Men	Women
15-24	36	15	21	3	2	1	8.3	13.3	4.8
25-34	116	42	74	18	9	9	15.5	21.4	12.2
35-44	142	54	88	26	14	12	18.3	25.9	13.6
45-54	175	66	109	41	13	28	23.4	19.7	25.7
55-64	154	55	99	53	28	25	34.4	50.9	25.3
65-74	169	65	104	89	36	53	52.7	55.4	51.0
75-84	63	22	41	39	15	24	61.9	68.2	58.5
85-94	13	3	10	11	3	8	84.6	100.0	80.0
Total	868	322	546	280	120	160	32.3	37.3	29.3

Although the total incidence of arrhythmias in women was higher, the percentage of arrhythmias found in men with symptoms or coincidental findings was higher (37% versus 29% $p<0.02$). The percentage of arrhythmias increased significantly ($p<10^{-8}$) with age (Table III). Almost no arrhythmias were found in the age category 15-24, while the majority were found in the elderly: half of the arrhythmias were found in patients 55-74 years of age. Table IV gives an overview of the detected arrhythmias. There was a high percentage of patients with extrasystoles and atrial fibrillation. Severe arrhythmias such as sinus arrest, ventricular tachycardias and tachycardias in the setting of the Wolf-Parkinson-White syndrome, were infrequent in this general practice population. Most of the

Table IV. ECG diagnosis in patients with an arrhythmia.

ECG diagnosis	Patients (n=868)					
	Total	%**	Men (%) n=322	Women (%) n=546	With new complaint	With diagnostic problem
Ventricular extrasystoles	68	24.3	26 (8.1)	42 (7.7)	52	16
Supraventricular extrasystoles	34*	12.1	11 (3.4)	23 (4.2)	28	5
Supra- and ventricular extrasystoles	5	1.8	3 (0.9)	2 (0.4)	5	0
Subtotal extrasystoles	107	38.2	40 (12.4)	67 (12.3)	85	21
Atrial fibrillation	64	22.9	30 (9.3)	34 (6.2)	53	11
Sinus bradycardia	40	14.3	24 (7.5)	16 (2.9)	39	1
Sinus tachycardia	36	12.9	8 (2.5)	28 (5.1)	35	1
Atrial flutter	6	2.1	4 (1.2)	2 (0.4)	5	1
Sinus arrhythmia	5	1.8	3 (0.9)	2 (0.4)	5	0
Supraventricular tachycardia not specified	4	1.4	2 (0.6)	2 (0.4)	4	0
Regular atrial rhythm	4	1.4	1 (0.3)	3 (0.5)	4	0
Chaotic atrial rhythm	3	1.1	2 (0.6)	1 (0.2)	3	0
AV nodal tachycardia	3	1.1	1 (0.3)	2 (0.4)	3	0
Atrial tachycardia	2	0.7	1 (0.3)	1 (0.2)	2	0
Atrial bigeminy	2	0.7	2 (0.6)	0 (0.0)	2	0
Idioventricular rhythm/sinus arrest	2	0.7	1 (0.3)	1 (0.2)	2	0
Ventricular tachycardia	1	0.4	1 (0.3)	0 (0.0)	0	1
Circlus movement tachycardia	1	0.4	0 (0.0)	1 (0.2)	1	0
Total	280	100.0	120 (37.3)	160 (29.3)	243	36

* In one patient with supraventricular extrasystoles it was not known whether the arrhythmia was new.
** Percentage of arrhythmias detected.

Table V. ECG diagnosis in patients with symptoms or physical findings suggesting an arrhythmia, by age (n=868).

Age group	Total	SR		SVES		VES		AF		ST		SB		other	
	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%
15-24	36	33	91.7	0	0.0	0	0.0	0	0.0	1	2.8	2	5.6	0	0.0
25-34	116	98	84.5	1	0.9	3	2.6	1	0.9	6	5.2	6	5.2	1	0.9
35-44[1,2]	142	115	81.0	3	2.1	8	5.6	2	1.4	1	0.7	10	7.0	4	2.8
45-54	175	134	76.6	7	4.0	11	6.3	5	2.9	8	4.6	7	4.0	3	1.7
55-64	154	101	65.6	3	1.9	15	9.7	16	10.4	7	4.5	6	3.9	6	3.9
65-74[2]	169	80	47.3	14	8.3	29	17.2	21	12.4	9	5.3	8	4.7	10	5.9
75-84[3]	63	24	38.1	10	15.9	6	9.5	13	20.6	4	6.3	0	0.0	7	11.1
85-94	13	2	15.4	1	7.7	1	7.7	6	46.2	0	0.0	1	7.7	2	15.4
Total	868	587	67.6	39	4.5	73	8.4	64	7.4	36	4.1	40	4.6	33	3.8

Abbreviations: SR = Sinus rhythm, SVES = Supraventricular extrasystoles, VES = Ventricular extrasystoles, AF = Atrial fibrillation, ST = Sinus tachycardia, SB = Sinus bradycardia.

[1]In one patient there was no complete ECG recording.
[2]Two patients had VES and SVES.
[3]One patient had VES and SVES.

detected arrhythmias (87%) were not previously known in these patients, including some severe arrhythmias.

Apart from the increasing total percentage of arrhythmias, the percentage of atrial fibrillation ($p<10^{-8}$) and supraventricular and ventricular extrasystoles ($p<10^{-4}$) also increased with advancing age. Atrial fibrillation was found in 16% of the patients aged 65 years and older. Correlations with age were not present for sinus bradycardia and sinus tachycardia. The occurrence of the remaining arrhythmias was also related ($p<10^{-4}$) to higher age (Table V).

Discussion

The figure of 2-3 new arrhythmias per 1000 listed patients per year seen by the GPs in our study is in accordance with the figures from existing registration networks. Most of the arrhythmias were detected as a result of symptoms, particularly palpitations. Relatively more arrhythmias were detected in men and in patients with symptoms possibly caused by haemodynamic imbalance. The medical history of patients in this study population is a typical reflection of the history of patients in a general practice population, with relatively few cases of specific cardiovascular disease and quite a large amount of psychosocial and psychiatric morbidity. A positive medical history of cardiovascular disease was obtained relatively more frequently in men. The large percentage of patients known to have hyperventilation was striking. This is in accordance with other studies in which there was an apparent association between a history of psychiatric illness and palpitations (16,17). Of the detected arrhythmias, 90% were less severe and could be considered within the territory of the GP. The highly positive correlation between the occurrence of arrhythmias and age, especially atrial fibrillation and extrasystoles, is in accordance with the literature (5-8,10). The incidence found in this study was based on patients who consulted their GP because of symptoms or with coincidental findings. It is likely that the population-based incidence of arrhythmias such as extrasystoles and atrial fibrillation is larger because arrhythmias may be asymptomatic or do not bother the patient. The figures in our study give a reliable presentation of patients with arrhythmias in general practice because the patients were studied in a health care system in which all the patients are registered with a GP without free access to specialist care. More arrhythmias, e.g. arrhythmias of short duration, would have been detected with 24-hour ambulatory ECG, but such equipment is not used in general practice. Furthermore, results from 24-hour ambulatory ECG cannot be adopted because then the majority of people would have had arrhythmias and its clinical relevance would have been questionable. According to the literature, only in a minority of patients, and particularly in the young, with symptoms that indicate an arrhythmia, can an arrhythmia be detected in general practice. This is partly due to the paroxysmal character of most arrhythmias. Besides, symptoms such as palpitations are also associated with many other somatic and psychiatric diseases. Because of the low prior probability of severe arrhythmias, the GP has to be especially alert and must make use of information from the medical history and the symptoms and signs, complemented eventually by ECG monitoring when diagnostic certainty is needed. The large prior probability of arrhythmias in the elderly makes ECG monitoring in older patients with symptoms useful in most instances. Despite the suggestion in the literature that patients with palpitations have in general no increased risk of sudden death or cardiovascular morbidity and mortality (18), it is very important to check whether the symptoms could have been caused by an arrhythmia. It is important for GPs to detect rare severe arrhythmias and to diagnose arrhythmias which they can manage without referral; but it is also important for them to detect innocent arrhythmias, which can be very unpleasant, in order to reassure the patient. Whilst the accessibility of general practices is in most instances better than that of hospitals, the GP can also play an important role in detecting paroxysmal arrhythmias of short duration.

We conclude that an arrhythmia can indeed be detected in general practice in a substantial proportion of patients with symptoms or physical findings leading to the suspicion of an arrhythmia. In the detection of arrhythmias, and the differentiation between severe and innocent ones, not only age and prior probability are important, but also gender and the diagnostic value of symp-

toms and signs. Further study on this diagnostic value in arrhythmias is recommended.

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