



Available online at  
**SciVerse ScienceDirect**  
[www.sciencedirect.com](http://www.sciencedirect.com)

Elsevier Masson France  
**EM|consulte**  
[www.em-consulte.com/en](http://www.em-consulte.com/en)



ORIGINAL ARTICLE



# Success and failure factors for hearing-aid prescription: Results of a French national survey

A. Abdellaoui, P. Tran Ba Huy\*

Service ORL, hôpital Lariboisière, 2, rue Ambroise-Paré, 75010 Paris, France

## KEYWORDS

Age-related hearing loss;  
Hearing-aid;  
National survey;  
Socioeconomic factors

## Summary

**Objectives:** To identify epidemiological, socioeconomic, audiometric and environmental factors of success and failure of hearing-aid prescription, and to assess hearing-aid efficacy at 6–9 months after prescription.

**Patients and methods:** A prospective nationwide survey was conducted in France on 184 patients with age-related hearing loss. Inclusion data were collected by a questionnaire filled out by the ENT specialist and patient, and with a second questionnaire filled out by telephone contact with the patient 6–9 months later.

**Results:** One-third of patients failed to fulfill the prescription, either for financial reasons or for lack of interest in correcting their disability. For the other two-thirds, the factors favoring consultation with a hearing-aid fitting specialist seemed to be: leisure activity requiring good hearing, living in a couple or family, spontaneous initial ENT consultation, strong motivation, monthly income greater than €1200, longstanding hearing impairment, and difficulty in listening to television and following a conversation in noise. Eighty percent of hearing-aid trials were successful; 60% of prescriptions were thus followed by hearing-aid purchase. The main three criteria determining purchase were the advice of the hearing-aid fitting specialist, and the price and the effectiveness of the apparatus on trial. In the four daily life situations presented in the questionnaire, the hearing-aid was worn for 8 hours or more in 90% of cases, found useful in 70% and proved satisfactory in 70%. Age-related hearing loss, whether metabolic or sensorineural, benefited from hearing-aid correction in 86% of cases.

**Conclusions:** Indications for hearing-aid prescription should take account of the patient's degree of motivation, awareness of disability, and income. The advice of the ENT and hearing-aid fitting specialists plays a key role in the patient's acceptance of the hearing-aid. Hearing-aids seem to enhance quality of life significantly in age-related hearing loss subjects.

© 2013 Published by Elsevier Masson SAS.

## Introduction

To date, hearing-aid fitting is the main if not only treatment for age-related hearing loss. However, while the population of elderly hearing-impaired subjects in France is estimated at around 6 million, many studies have found that only 20%

\* Corresponding author. Tel.: +33 1 49 95 80 57;  
fax: +33 1 45 25 56 30.

E-mail address: [patrice.tran-ba-huy@lrh.aphp.fr](mailto:patrice.tran-ba-huy@lrh.aphp.fr)  
(P. Tran Ba Huy).

use hearing-aids, compared to 30% in the UK and 60% in Denmark [1–3]. Several factors are usually put forward to account for this: denial of disability, prohibitive cost, poor national health insurance cover, negative image of hearing-aid wearing (seen as a sign of aging), dissatisfaction of some other hearing-aid users, etc.

The present prospective study therefore sought to clarify the epidemiological, socioeconomic, audiometric and environmental factors for success and failure of hearing-aid prescription, and the influence of the opinion and advice of the ENT and hearing-aid fitting specialists involved in the prescription. It was based on a nationwide French survey conducted with the help of 42 ENT physicians, with 184 patients followed up at 6–9 months after hearing-aid prescription delivered after audiometric assessment for age-related hearing loss.

## Patients and methods

Forty-two ENT specialists (in private practice or hospital practice or in complementary insurance health centers throughout France) were involved in patient recruitment. Inclusion criteria were: age greater than 55 years, French-speaking, with age-related perception hearing loss on audiometry, receiving first hearing-aid prescription, free of skin pathology hindering hearing-aid wearing, and having given informed consent.

Data collection was in two steps:

- at first consultation, after decision to prescribe, using a questionnaire (T0: [Appendix 1, electronic supplementary material is available](#)) filled out by the ENT physician and separately by the patient;
- a second questionnaire (T1: [Appendix 2, electronic supplementary material is available](#)) filled out 6–9 months later by telephone contact with the patient.

These two questionnaires were the French translation of the Glasgow Hearing-Aid Benefit Profile [4]. They were intended to identify the sociodemographic characteristics of the patients, and their motivation and expectations, to follow-up the course of hearing-aid fitting and determine patient satisfaction in four situations between which hearing-aid benefit may differ (listening to television, following a conversation without background noise, following a conversation in the street or in a busy shop, and following a group conversation) and the parameters of hearing-aid use.

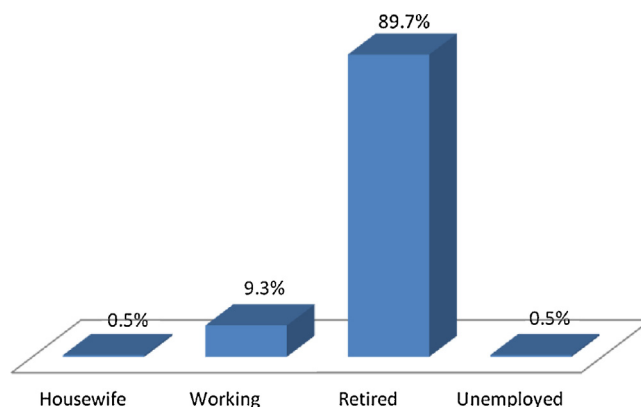
Statistical analysis used the Statistical Package For Social Science (SPSS). Qualitative variables were compared on Chi<sup>2</sup> test. Factors of success were assessed on logistic regression.

## Results

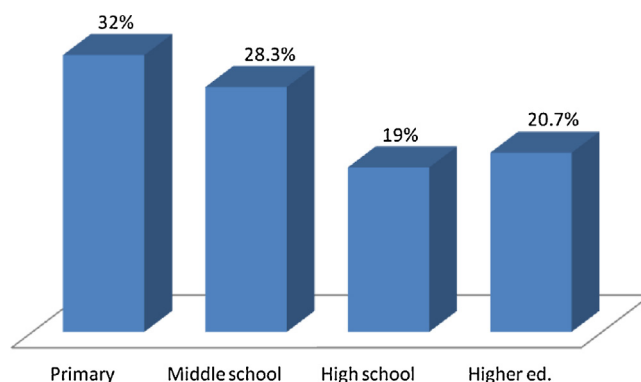
One hundred and eighty-four patients were included.

### Study population data

The study population comprised 94 women (51.1%) and 90 men (48.9%) (sex ratio, 1.04); mean age, 74.2 ± 10.3 years (range, 55 to 92 years).



**Figure 1** Distribution of patients according to occupational status.



**Figure 2** Distribution of patients according to educational level.

Examination found diabetes in 8.2% of cases, high blood pressure in 38% ( $n = 69$ ), hypercholesterolemia in 9.8%, and occupational or leisure acoustic trauma in 28.3%. Family history of age-related hearing loss was reported by 76 patients (41.3%). [Figs. 1 and 2](#) and [Table 1](#) present the patients' situation, occupation and educational level.

Favorite No-occupational activities were music in 20% of cases, involvement in associations in 15%, sport in 12%, theatre in 7%, movies in 6% and plastic arts in 2% ([Fig. 3](#)).

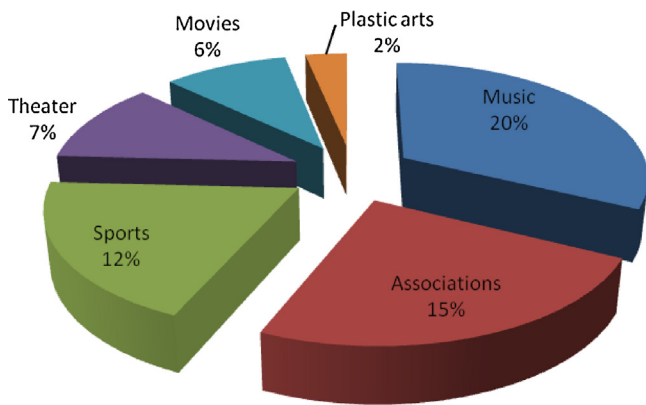
Life-style analysis found that 61.4% were living in a couple, 27.7% alone, and 10.9% in a family.

[Fig. 4](#) shows monthly incomes.

Two types of age-related hearing loss were distinguished on audiometry: "strial" or "metabolic" (68%), showing a flat or slightly descending audiometry curve with less than 20 dB difference between the 500 Hz and 4 kHz thresholds;

**Table 1** Patient's occupation.

Occupational category	Number of patients	Rate (%)
Office worker	77	42
Higher executive	47	25
Manual	22	12
Unemployed	14	8
Skilled manual, shopkeeper	13	7
Farmer	11	6



**Figure 3** Distribution of patients according to favorite activities.

and sensorineural (32%), showing a descending curve with more than 20 dB difference between the 500 Hz and 4 kHz thresholds.

Mean audiometric thresholds were  $38.8 \pm 11.3$  dB (range, 15 to 84 dB) in the right ear and  $39.5 \pm 12.5$  dB (range, 10 to 110 dB) in the left ear; there was no quantitative difference according to type of hearing loss, but only a difference in form of curve.

Evolution was more than 5 years in 47.8% of cases and 1–5 years in 44.6%.

Self-reported motivation was strong in 44% of patients, moderate in 43% and weak in 10%.

ENT consultation was spontaneous in 62.5% of cases ( $n = 115$ ) and spurred by family or friends in 37.5% ( $n = 69$ ).

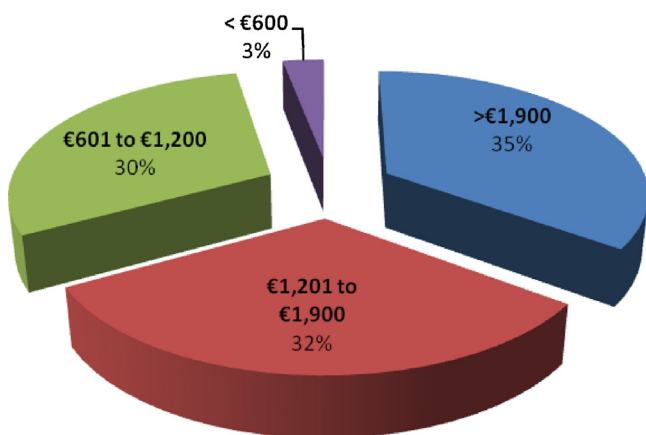
### Factors of prescription success or failure

Success and failure factors are presented in Table 2.

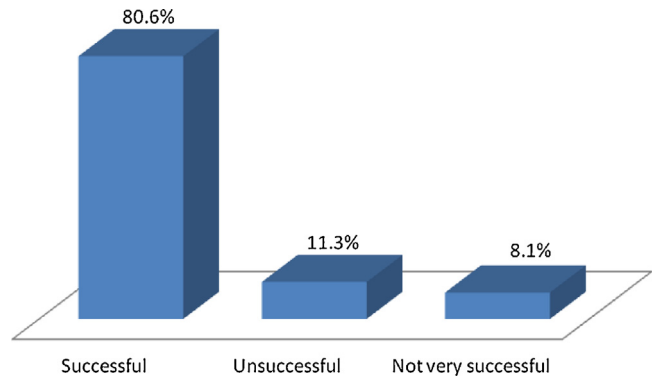
### Results of prescription

#### Trials and results

Sixty-seven percent of patients tried out a hearing-aid as a result of prescription, with success in 80.6% of cases (Fig. 5).



**Figure 4** Distribution of patients according to monthly income.



**Figure 5** Result of hearing-aid trial.

**Interval between consultation and hearing-aid purchase**  
Mean interval between consultation and hearing-aid purchase was  $2.7 \pm 1.5$  months (range, 1–9 months).

#### Financial aspect

For 30% of fitted patients, financial considerations had impacted purchase, the cheapest model being chosen.

#### Hearing-aid purchase

Sixty of the 184 patients did not follow-up their ENT prescription and 15 more did not purchase a hearing-aid, due to unsatisfactory trials. Thus, only 109 patients (59.2%) purchased a hearing-aid.

#### Main hearing-aid choice criteria

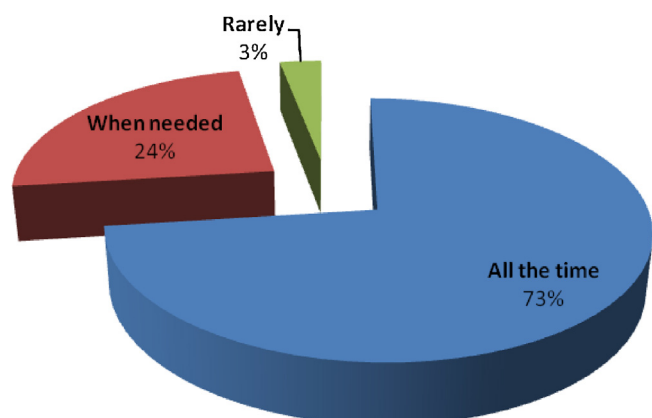
The main hearing-aid choice criteria were:

- hearing-aid fitting specialist’s advice (37%);
- price (30%);
- effectiveness on trial (18%).

#### Hearing-aid wearing

#### Hearing-aid use

Hearing-aid use is illustrated in Fig. 6.



**Figure 6** Use of hearing-aid.

**Table 2** Univariate analysis of hearing-aid prescription success factors.

	Hearing-aid trial		P
	Yes	No	
<i>Epidemiological data</i>			
Favorite activity			0.02
Music, theater, movies	103	17	
Sports, plastic arts	21	4	
Educational level			0.01
Primary-, middle-school, high-school (baccalauréat)	105	41	
Higher education	19	19	
Living situation			0.025
Alone	28	23	
In couple, family	96	31	
Monthly income			0.008
≤ €1200	34	28	
> €1200	90	32	
Evolution of hearing impairment			0.011
≤ 5 years	57	39	
> 5 years	67	21	
Consultation			< 0.0001
Spontaneous	90	25	
Recommended	34	35	
Patient's motivation			0.002
Weak to medium	60	43	
Strong	64	17	
<i>Everyday situations</i>			
Difficulty listening to TV with family			0.017
No/moderate	68	42	
Great/insurmountable	48	19	
Difficulty following conversation in noise			0.013
No/moderate	59	39	
Great-insurmountable	63	19	
Difficulty following conversation in group in noise			0.01
No/moderate	47	35	
Great/insurmountable	76	25	

### Follow-up after fitting

Eighty-nine percent of patients returned to their hearing-aid fitting specialist at least once (mean,  $4 \pm 2.3$  times); only 12% returned in ENT consultation. The main reasons for return to the hearing-aid fitting specialist were: settings (37.5%) and difficulties in use or cleaning (12%).

### User satisfaction

User satisfaction is illustrated in [Tables 3 and 4](#).

### Discussion

The present prospective study had two principal objectives:

- to study the fitting process over the 6–9 months period following ENT prescription, and analyze the

**Table 3** Impact of hearing-aid on everyday items.

	Yes (%)	No (%)
Change in activities	21	79
Visibility of hearing disability	6	94
Esthetic satisfaction	96	4
Sound seems artificial	33	67
Use with telephone	56	44
Reliability of aid	90	10
Adapted to needs	87	13
Local skin effects	11	89

**Table 4** Satisfaction in four daily life situations.

Situations	Listening to TV with family (%)	Following a conversation without noise (%)	Following a conversation in the street (%)	Following a conversation in group (%)
HA use time (from ½ to full time)	86	87	90	90
HA usefulness (from useful to perfect hearing)	75	76	60	64
Satisfaction (satisfied to delighted)	76	75	63	76
Difficulty of wearing HA (great to insurmountable)	3	4	8	10

HA: hearing-aid.

epidemiological, personal, audiometric, socioeconomic and environmental factors of success or failure and the role of specialist advice;

- to assess patient satisfaction and thus the effective usefulness of hearing-aids in four situations of varying potential benefit.

A strong point of the study was that it was conducted by ENT physicians free of conflict of interest. This is noteworthy inasmuch as most hearing-aid studies have been conducted by hearing-aid fitting specialists and/or manufacturers. Thus the largest recent study was Euro Trak France 2009, designed and performed by Anovum (Zürich) for the European Hearing Instrument Manufacturers Association (EHIMA); the study involved 15,545 subjects, including 1304 hearing-impaired subjects, 803 of whom were hearing-aid users and 501 not. This is an interesting database for comparison with the present findings [5].

## Epidemiology

Epidemiological analysis found a mean age of 74 years, with a balanced sex ratio. Medical history was broadly comparable to that of the French over –65 population: 8.2% vs. 11% diabetes, 37.5% vs. 33% high blood pressure, and 9.8% vs. 12% hypercholesterolemia. The fact that a third of the present population had history of occupational or leisure acoustic trauma highlights the importance of environmental factors in age-related hearing loss.

Two-thirds of the present population were living in couples or families, and nine in 10 were retired; these findings are relevant to management.

## The hearing-aid fitting process

### Refusal

One-third of patients ( $n=60$ ) did not consult any hearing-aid fitter following the ENT prescription. This high figure deserves consideration.

Fifty-five of these 60 patients agreed to explain their reasons. A few referred to a bad reception on the part of the ENT or hearing-aid fitting specialist ( $n=2$ ), unsatisfactory

experiences among family or friends ( $n=1$ ), intercurrent health issues ( $n=3$ ), or fear of being “cheated” ( $n=2$ ); but most referred to the following:

- excessive price ( $n=27$ ), critically associated with insufficient income, lack of knowledge of insurance cover, low rate of insurance cover, or lack of complementary health insurance;
- lack of real interest in improving hearing ( $n=20$ ).

In the latter category, it is noteworthy that a half of these patients had consulted not spontaneously but under family pressure and that 13 recognized a low or only moderate level of motivation; they doubtless consulted their ENT physician for a medical opinion on their disability and, once reassured that it was benign, did not follow-up the prescription.

The information delivered by the ENT physician thus has a role to play in the patient’s disability awareness.

### Hearing-aid trials and purchase

Only two-thirds of patients tried a hearing-aid, at a mean interval of 3 months. 80% of trials were successful. 59.2% of those for whom it was prescribed acquired a hearing-aid.

This figure may be compared to the corresponding Euro Trak “adoption” rate of 30% in 65–74 year-old hearing-impaired subjects and 39% in those aged 74 years or over.

The present findings on refusal, trials and acquisition can be compared to those of Euro Trak, where only 72% of hearing-impaired subjects consulted an ENT or family physician for advice, and only 40% of these were then prescribed a hearing-aid, and only 30% of those then consulting a hearing-aid fitting specialist finally purchased a hearing-aid.

It would thus seem that the ENT specialists in the present study were more persuasive than those in the Euro Trak study. At all events, the findings confirm those of the literature [6]: that specialist advice plays an important role in hearing-aid acquisition. Awareness of the impact of hearing impairment and of the possibilities of aid, referral to a fitting specialist and the quality of hearing-aid setting are decisive in the patient’s ultimate decision.

### Economic aspect

Analysis of standard of living sought to unmask any selection bias due to over-representation of comfortable socio-occupational categories. Two-thirds of the patients had monthly incomes exceeding €1200 (for a poverty threshold of €954 in France in 2009).

Given that, in the context of the present study, the average price of a hearing-aid was €1500 ± 380 per ear, and that the French national health insurance scheme covered €134 ± 60 and complementary health insurance covered a further €362 ± 246, it is understandable that for one-third of the 119 patients who tried and bought a hearing-aid (36 patients: 30%) financial considerations led them to choose the cheapest model.

### Factors of ENT prescription success or failure

Univariate analysis disclosed factors significantly associated with following up the ENT prescription: leisure activities (music, movies or theater) requiring good hearing, living in a couple or family, spontaneous ENT consultation, strong motivation, monthly income exceeding €1200, longstanding hearing impairment, and difficulty in listening to television and to conversation in noise.

One factor is surprising but worth underlining: educational level was inversely correlated with prescription success. Patients with only a primary- or middle-school level seem more concerned about hearing than higher executives.

Factors not affecting consultation with a hearing-aid fitting specialist were: age, gender, medical history and history of acoustic trauma, occupational status (retired or not), occupation or difficulty in following conversation without noise.

### Hearing-aid purchase and choice

The main three criteria in hearing-aid purchase and choice were the advice of the hearing-aid fitting specialist (37%), and hearing-aid price (30%) and effectiveness on trial (18%).

In the Euro Trak study, the most significant decision factors were severity of impairment, the opinion of and the rapport with the ENT and fitting specialists, and family environment. In another report [7], the seven most significant decision factors were ease of use, fulfillment of expectations, cost, degree of hearing loss, quality of hearing-aid fitting service, experience of family and friends, and efficacy of possible alternative treatments.

### Hearing-aid efficacy

The second study objective was to assess hearing-aid efficacy. This question was raised by ANDEM in 1996 in the medical guidelines on hearing loss and surgery [8], and is implicitly recognized by medical and paramedical professionals when they regularly stress the problem of abandonment of hearing-aid use. In the international literature, the short- and long-term rates of No-use in elderly subjects range from 20% to 30% [2,9]; in France, however, there were no prospective epidemiological studies quantifying hearing-aid use rates.

Some of the present findings may be highlighted here:

- 80% of trials were successful;

- 90% of purchasers found their hearing-aid reliable;
- 87% found it well-adapted to their needs;
- 92% no longer felt disabled;
- 73% used their hearing-aid all the time.

In the four daily life situations of the questionnaire, hearing-aid use was for 8 hours or more in 90% of cases, beneficial in 70% and satisfactory in 70%, with a 6% rate of difficulty of use.

The Euro Trak study reported 86% of users to be satisfied, about 8 hours' use per day, correlation between satisfaction and number of hours' use and 85–91% good contact with the hearing-aid fitting specialist.

Type of hearing loss seemed to be unrelated to success: both metabolic and sensorineural forms [10] benefited from amplification in 86% of cases.

Hearing-aid use thus seems to provide benefit at the psychological, social and quality of life levels [11].

## Conclusions

The present prospective survey, the first to be conducted in France by ENT specialists independent of hearing-aid manufacturers, showed that:

- one-third of age-related hearing loss patients failed to follow-up ENT hearing-aid prescription, either for financial reasons or from lack of motivation;
- indications should therefore take closer account of patient's motivation, immediate environment, disability awareness and income;
- costs (including setting and follow-up) borne by the patient set limits in terms of decision to purchase and choice of model;
- 80% of trials were successful, leading to a 60% rate of purchase in the study population as a whole;
- the ENT physician is the prescriber and first advisor, with a fairly limited role in follow-up but probably essential to the patient's disability awareness;
- the hearing-aid fitting specialist's advice is determining in the decision to acquire a hearing-aid;
- efficacy in daily life situations, and thus benefit in quality of life, seem significant.

## Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

## Acknowledgments

The authors warmly thank their 42 ENT colleagues who took apart in the study, and the Entendre group who agreed to provide exceptionally useful logistic support.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.anorl.2012.09.014>.

## References

- [1] French hearing-aid fitting specialists' website: [www.audiofr.com](http://www.audiofr.com)
- [2] Popelka MM, Cruickshanks KJ, Wiley TL, et al. Low prevalence of hearing-aid use among older adults with hearing loss: the epidemiology of hearing loss study. *J Am Geriatr Soc* 1998;46:1075–107.
- [3] Bentler RA, Niebuhr DP, Getta JP, et al. Longitudinal study of hearing-aid effectiveness, objective measures. *J Speech Hear Res* 1993;36:808–19.
- [4] Gatehouse S. The Glasgow hearing-aid benefit profile: what it measures and how to use it. *Hear J* 2000;53:10–8.
- [5] Euro Trak – France 2009. Anovum/EHIMA.
- [6] Southall K, Gagne JP, Leroux T. Factors that influence the use of assistance technologies by older adults who have a hearing loss. *Int J Audiol* 2006;45:252–9.
- [7] Laplante-Lévesque A, Hickson L, Worrall L. Factors influencing rehabilitation decisions of adults with acquired hearing impairment. *Int J Audiol* 2010;49:497–507.
- [8] Chirurgie de la surdit . Recommandations et r f rences m dicales. 1995. ANDEM.
- [9] Gates GA, Cooper JC, Kannel WB, et al. Hearing in the elderly: the Framingham cohort, 1983–1985. *Ear Hear* 1990;11:247–56.
- [10] Schuknecht HF. Pathology of the ear. Cambridge, MA: Harvard University Press; 1974.
- [11] Sprinzel GM, Riechelmann H. Current trends in treating hearing loss in elderly people: a review of the technology and treatment options – A mini-review. *Gerontology* 2010;56:351–8.