

How do referring clinicians want radiologists to report? Suggestions from the COVER survey

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Received: 15 March 2011 / Revised: 18 May 2011 / Accepted: 7 July 2011 / Published online: 29 July 2011
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Abstract

Objective To investigate what referring clinicians suggest when asked how the quality of radiology reports can be improved.

Methods At the end of the questionnaire of the COVER survey, a bi-national quantitative survey on the radiology report among referring physicians, clinical specialists and general practitioners were able to freely enter suggestions with regard to improving the quality of the report. These

suggestions were isolated from the quantitative results. Subjects and themes were identified, examined, ordered, counted, compared and analysed.

Results Of a total of 3,884 invitations to participate, we received 735 response forms from clinicians (18.9%), 233 (31.7%) of which contained suggestions. Issues mentioned most frequently were the need for clinical information and a clinical question, for a conclusion, structuring, communicating directly with the clinician, completeness, integrating images or referring to images, mentioning relevant findings outside of the clinical question, mentioning a diagnosis or suitable differential diagnosis, and concise reporting.

Conclusion Although these spontaneous suggestions are erratic and sometimes contradictory, they summarise the ideas as well as the emotions of these clients of the radiology department. Therefore it is advisable to take them into account when developing new ways of reporting.

Keywords Radiology report · Preferences · Structured reporting · Communication in radiology

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Introduction

Does the radiology report, radiology's most conspicuous and permanent product [1], in its present form, meet the expectations of referring clinicians? And if not, how can the report, and in a broader sense the communication between radiologists and referring clinicians, be improved?

One of our recent projects at the University of Antwerp is COVER (Clinicians' Opinions, Views and Expectations concerning the radiology Report), a bi-national survey in the Netherlands and Flanders, the Dutch-speaking part of Belgium. The quantitative results of these surveys have been reported recently [2]. At the end of the COVER

questionnaire, respondents were able to make suggestions on how to improve the radiology report.

In this article, we present a synthesis of the suggestions of referring clinicians, both hospital specialists and general practitioners. We are well aware of the fact that radiologists are clinicians too but for practical purposes we will use the term ‘clinicians’ as shorthand for ‘referring clinicians’ in this paper.

Materials and methods

Permission for the COVER internet survey was obtained from the Institutional Review Board of the authors’ medical center. Informed consent and HIPAA compliance were waived by the Ethics Committee, as no patient health data were used in the surveys. The survey was locally approved by the participating hospitals. The investigators did not seek external funding for this project.

The medical director of each hospital sent an e-mail to all clinical specialists who routinely prescribe imaging examinations to invite them to participate. The e-mail addresses of general practitioners (GPs) were found in the 2008 address book of the Order of Physicians of the Province of Antwerp, and all those who had such an address received the e-mail directly from the investigators. By clicking a hyperlink in the e-mail, responders were referred to a digital questionnaire prepared using SurveyMonkey, a commercial tool for internet surveys (SurveyMonkey, Portland, OR, USA).

The main part of the survey consisted of a set of 46 statements on the radiology report, for which respondents were asked to indicate their level of agreement according to a five-tiered Likert scale. At the end of this section, respondents could freely give suggestions for improving the radiology report. The survey was performed in two university and two community hospitals in Flanders, one university and one community hospital in The Netherlands, and among the general practitioners (GPs) in the province of Antwerp, Flanders. It took place in two consecutive waves of 2 weeks in the course of the second half of 2008 or the first half of 2009, according to the institution. After these two waves of 2 weeks, the survey was closed and the results were downloaded. The suggestions were separated from the quantitative results. The investigators identified, examined, ordered, counted, compared and synthesised subjects and themes by means of qualitative analysis software (QSR NVivo 8, QSR International, Doncaster, VIC, Australia).

Results

Of a total of 3,884 invitations to participate, we received 735 response forms from clinicians (18.9%). The rate of

completed response forms with suggestions ranged from 29.1 to 37.5%, according to the institution or target group (average 31.7%, i.e. 233 out of 735) (Table 1). Of the clinicians who made suggestions, 148 (63.5%) were male and 85 (36.5%) were female. Their ages ranged from 26 to 78 years (average 46.4, median 46, standard deviation 10.7). An overview of the medical specialty of the responders can be found in Table 2.

Fifty-one different themes were identified, and suggestions were linked to one or several of these themes (Table 3). We only present these numbers as an indication of the relative importance of the themes to the respondents. As we do not report the results of a quantitative study, we do not further specify the number of respondents who put forward each and every idea we present in this section.

In the following sections, we present a synthesis of these suggestions, as well as a selection of quotes. Each quote is accompanied by a note stating specialty, age, gender and place of activity (*FL* Flanders, Belgium, *NL* the Netherlands) of the person quoted. This section is presented in a narrative form. We have refrained from any form of interpretation in this section.

The radiologist as a clinical specialist

Many respondents thought it is the duty of the referring clinician to provide the radiologist with useful clinical information and a clear and unequivocal clinical question. It was felt that the clinical questions provided in the request form should be addressed in the report. *“If the question is: ‘Pneumonia?’, not just: ‘No abnormal findings’ but also: ‘No signs of pneumonia’, so we know the radiologist has looked at the patient with the eye of a clinician.”* (Anesthesiologist, M, 41, NL) Answering questions with new questions was considered inappropriate.

Several clinicians, GPs especially, were convinced that the radiologist does not always read the clinical question on the request. *“I often ask very concrete questions, which seldom get answered. So can I suppose they haven't been read?”* (GP, M, 40, FL)

One of the respondents wrote *“If radiologists would present themselves credibly as imaging clinicians, referring clinicians would be more prone to provide useful information”*.

Mentioning the absence of clinical information was deemed unjust towards the referring clinician: *“A note saying: ‘Clinical information: none’ suggests that the referring clinician has not transmitted any information, while the request may have been lost, may have been removed by the technician, the patient was unable to present it, etc.”* (Ear, nose and throat specialist, M, 54, FL)

One colleague was convinced that radiologists make too little use of their right to read the electronic patient record (EPR) of inpatients for useful information. Another thought

Table 1 Response rates of clinicians and rate of completed questionnaires with suggestions in COVER

Centre or group	Sent	Responded (%)	With suggestions (%)
Community hospital 1 NL	59	16 (28.1)	6 (37.5)
University hospital 1 NL	1,391	163 (11.7)	59 (36.2)
Community hospital 2 FL	119	76 (63.9)	23 (30.3)
Community hospital 3 FL	45	25 (55.6)	8 (32.0)
University hospital 2 FL	359	65 (18.1)	21 (32.3)
University hospital 3 FL	590	108 (18.3)	34 (31.5)
Total clinical specialists	2,561	453 (17.7)	144 (31.8)
Total GPs	1,323	282 (21.3)	82 (29.1)
Grand total	3,884	735 (18.9)	233 (31.7)

NL The Netherlands, FL Flanders, Belgium

that in the case of complex clinical questions, the radiologist should see the patient before and after the examination.

Responsibilities of the referring physician and the radiologist

Clinicians were well aware of their responsibility to request the most appropriate examination. If the radiologist does

Table 2 Specialities represented among responders with suggestions, absolute number and percentage of total

Speciality	Number	Percentage
General practice	82	35.2
Paediatrics	15	6.4
Surgery	15	6.4
Internal medicine (general)	12	5.2
Other (not listed)	12	5.2
Oncology	11	4.7
Gynaecology	11	4.7
Anaesthesiology	11	4.7
Cardiology	9	3.9
Orthopaedics	8	3.4
Gastroenterology-hepatology	8	3.4
Physical and rehabilitation medicine	6	2.6
Ear, nose and throat medicine	6	2.6
Pulmonology	5	2.1
Urology	4	1.7
Neurology	4	1.7
Psychiatry	3	1.3
Ophthalmology	3	1.3
Dermatology	2	0.9
Endocrinology-diabetology	2	0.9
Emergency medicine	1	0.4
Rheumatology	1	0.4
Nephrology	1	0.4
Haematology	1	0.4
Total	233	100.0

not agree, she/he should not perform the examination and should contact the clinician. But: “*When a clinical specialist requests an examination, the radiologist has to check if the examination can answer the clinical question, but not question the indications for the examination.*” (Surgeon, M, 43, NL)

The selection of an examination protocol should be done by a radiologist himself, not by a roentgen technician. Standard protocols should be modified if necessary. “*Even with extensive clinical information, I often see routine sequences without sagittal T2-weighted images in case of hydrocephalus (aqueduct stenosis?) or without contrast when a brain tumor is suspected.*” (Non-listed specialist, M, 51, FL)

Content and structure of the radiology report

Content

Radiologists could complement a tentative diagnosis by giving a degree of certainty. On the other hand: “*No conclusions like ‘Infiltrate cannot be excluded’. No test has a sensitivity of 100%.*” (Nephrologist, M, 35, NL) Where appropriate, the conclusion should contain advice to the GP for follow-up examinations or for referral to a dedicated specialist.

In reports of complex examinations such as ultrasound, the radiologist should describe accurately what has been seen, not just note that the examination is normal. Pathological findings outside the scope of the examination however, e.g. a bone lesion on a chest X-ray, should always be mentioned. Describing normal findings extensively was judged not to be useful.

Each examination deserves a report of its own. “*They better not write the condition is unchanged. We sometimes have to go back three or four chest X-rays to know what the condition was...*” (Anesthesiologist, F, 40, FL)

If a diagnosis cannot be made, a differential diagnosis should be presented. “*In case several diagnoses are possible, it would help if the radiologist could give an idea of the probability of each one.*” (Internist, M, 55, FL)

Table 3 Frequency of themes mentioned three times or more in clinicians' suggestions for improving the report

Subject	Number of references	Subject	Number of references
Clinical information and the clinical question	94	Accessibility of the report	10
Conclusion/impression of the report	55	Multidisciplinary rounds	8
Structured reports	37	Content	7
Communicating directly to the clinician	25	Descriptive part of the report	7
Completeness	19	Report as training update for clinicians	7
Integrating images or referring to images	19	Satisfaction with the report	7
Relevant findings outside of the clinical question	19	Competence of the radiologist	6
Mentioning a diagnosis/differential diagnosis	19	Irrelevant reports	6
Concise reporting	17	Narrative reports	5
Electronic patient record (EPR)	16	Terminology	5
Vague reports/the hedge	16	Variable quality or approach	5
Suggestions for further examinations	16	Probability of a diagnosis	4
Use of abbreviations	14	Quality of the report	4
Use of a standard lexicon	14	Performing the right/inadequate examinations	4
Measuring lesions	13	Language	3
Proofreading reports	12	Preformatted text	3

Radiologists should 'stick their necks out' and take responsibility, rather than hiding themselves behind vague and ambiguous statements. "*The umbrella effect ('Tumor cannot be excluded') does not help us in any way.*" (GP, F, 49, FL)

Radiologists should always be aware of the specialty of the referring clinician and tailor their reports accordingly. "*Requesting X-rays is part of my routine as a cardiologist but reports invariably tell me there is no pulmonary infiltrate. I get the impression that the radiologist doesn't know anything about heart configuration, volume and so on.*" (Cardiologist, M, 66, FL)

Radiologists should only describe what they know: "*No comments on the quality and position of prostheses, as they are wrong most of the time.*" (Orthopaedic surgeon, M, 38, NL) Although radiologists may have a strong interest in the clinical side of medicine, their judgement should be based on the results of imaging procedures. "*I notice more and more often clinical diagnoses that cannot be made on the basis of imaging alone. [...] Radiologists have to distinguish diagnosis from suspicion.*" (Pulmonologist, M, 34, NL)

How about measurements? "*In case of a tumor, always measure! The same in follow-up examinations, instead of talking about 'further diminution'...*" (Pediatrician, F, 49, FL) And: "*Measurements would be more instructive if the standard deviation would be given. 'Liver too big for age' is less informative than 'liver volume too big, +3.5 SD'.*" (Neurologist, F, 36, NL) Measurements too should be linked to specific images.

Structure

Radiology reports should be much shorter, schematic and concise, some of the respondents thought. Verbosity should be avoided. Impenetrable blocks of text were rejected by some. "*Structure the report! So one can see in the wink of an eye where something abnormal was seen.*" (GP, M, 30, FL).

Reports should at least contain the clinical question, the examination technique, a description of the findings, a conclusion and sometimes advice. Other tips: important findings should be highlighted. "*Providing digital images (which are not compatible with our Mac!) is a waste of time unless they specify which images we need to look at.*" (GP, F, 50, FL) "*It would be interesting if the radiologist would use an arrow to indicate pathology like a hernia, a cyst on US... and especially in case of CT or MRI...*" (GP, F, 56, FL)

The conclusion was considered an essential part of the report by many, especially GPs. Several thought a discussion section (or a 'motivation' or 'interpretation' section as they called it) could be useful. It was felt that the conclusion should only contain relevant results, and more specifically the answer to the clinical question. It should not be longer than the descriptive part. Some respondents even believed that clinicians only read the conclusion of a report.

The use of templates to promote reporting consistency was advised by some but rejected by others. "*Standardization might help. Ready-to-use reports need to be avoided, they cause too many errors.*" (Surgeon, M, 56, FL) "No

computer-generated reports in which just a few words have been changed.” (GP, F, 49, FL)

The importance of applying guidelines and criteria for follow-up was emphasised. *“When evaluating scans in case of multiple sclerosis, use the Barkhof criteria.” (Neurologist, F, 36, NL)* *“The contents need to comply with international guidelines written with the help of radiologists. In oncology, the RECIST criteria are in vigor.” (Oncologist, M, 38, NL)*

Several respondents objected to unusual abbreviations or eponyms. *“It’s a nuisance having to call the radiologist to ask for an explanation.” (GP, F, 33, FL)*

What about the length of the report? According to some, reports of simple examinations can consist of one or two words, but reports of complex examinations should be substantial. However, several thought that long and tedious radiology reports often cover up the radiologist’s incompetence to answer the clinical question. And even when long reports are indicated, the conclusion should be short and clear.

Collaboration between radiologists and referring clinicians

The idea that easy communication between clinician and radiologist is in the interest of the patient and can prevent vague conclusions came up several times. If the radiologist sees something unexpected, or if an examination fails or causes adverse effects, he/she must call the clinician.

Clinicians mentioned the need to look at the images themselves, so they can give feedback to the radiologist. *“The direct phone number of the reporting radiologist should always be present, so they can be contacted in case something is not clear.” (GP, M, 30, FL)* And: *“Call centers are there for patients, not for doctors.” (Internist, F, 50, FL)* The report should also contain a schedule of the hours the radiologist can be reached directly. It was suggested that exceptionally complex examinations should be analysed together by radiologist and clinician.

If a radiologist on call, e.g. a resident-in-training, has reported an examination orally, what has been said should be quoted in the report. If the final report contradicts these preliminary conclusions, that should be mentioned too. *“Quite often a supervisor will add something to a report that was made during the night, with dramatic consequences for its conclusion. Transmission of such a change to the referring clinician should be obligatory.” (Surgeon, M, 36, NL)*

If they have a choice, clinicians would rather work with radiologists they know and trust. *“Some radiologists give very vague descriptions, but we most often know which ones do so.” (GP, F, 43, FL)* Radiologists do not have an easy job but in general they perform quite well, some clinicians thought. *“In general I am very satisfied. Radiologists do not have an easy job. Their’s is a great*

contribution to our work and a strong support for what we do.” (GP, M, 55, FL)

Casual remarks

If an examination has failed because the patient has moved or contrast medium administration was omitted, it is not enough to state this in the report. *“The examination should be repeated adequately, and only then reported.” (Orthopedic surgeon, M, 38, NL)*

In the case of ERCP examinations, the report often only refers to the results of endoscopy. Radiologists should describe the results of the contrast medium examination as well.

Interobserver variability is a problem in radiology. Imaging studies should be subjected to a double blind protocol, according to one respondent.

Normal terminology is to be preferred over academic slang. Reports can have an educational side: *“Good reports stimulate GPs to study the images and can become a refresher course for their knowledge of anatomy.” (GP, M, 64, FL)*

The flawless use of their mother tongue is dear to some clinicians. In addition to spelling, style and structure should also be correct. There is a need for terminological consistency: *“Standardization of terms like ‘bulging’, ‘hernia’, etc. Not all radiologists use the same terminology for the same disorder.” (GP, F, 50, FL)* Speech recognition is still a matter of dispute: *“Reports made using speech recognition are not corrected. That leads to hilarious situations but can also have medical/legal consequences.” (Surgeon, M, 36, NL).*

When proofreading, radiologists do not seem to look at the images again. The result may be grammatically and semantically correct, but what about, for example, left–right mistakes, one colleague said.

Discussion

Do radiologists make reports that fulfill the needs of the referring clinicians? In our study, many referring clinicians saw radiologists as peers who, in the interests of the diagnostic outcome, are entitled to receive as much clinical information as necessary. In exchange, clinicians expected radiologists to amend preset imaging protocols if these were inadequate or incomplete.

In the past, several studies have shown that the availability of clinical information and a pertinent examination question can indeed improve the diagnostic accuracy of the imaging process [3, 4]. If the requested examination is totally unfit to answer the clinical question, the radiologist is to contact the referring clinician. In a recent retrospective study, 26% of CT and MRI examination

requests by primary care physicians were considered inappropriate [5].

One respondent emphasised that handwritten clinical information should be readable. Trying to decipher handwriting can be a frustrating task. Calling the referring clinician is time-consuming, as is reading an inpatient's electronic record for clinical information. Electronic examination requests may offer a solution, but this will not solve the problem of imperfect requests by GPs, made while on a house call. These are often brief, if not minimal, and GPs can be notoriously difficult to reach for additional information during office hours. However, as portable GP information systems are already widely available, online requests by GPs may gradually replace ad hoc handwritten requests.

Non-technical abbreviations in a radiology report give an air of informality and imply that the radiologist was in a hurry; technical abbreviations run the risk of not being understood [6]. While they should be avoided as much as possible in radiology reports, abbreviations in examination requests can cause misunderstandings too, as well as a loss of precious time. Radiologists serve several tens of departments, some of which may use the same abbreviations for different conditions. Especially residents-in-training in rotating schedules may lack the experience to decipher all. Therefore, if their departments cannot provide a list of the abbreviations they use, clinicians ought to refrain from using them at all.

As for the conclusion, the *ACR 2005 Practice Guideline for Communication of Diagnostic Imaging Findings* states that unless the report is brief, each report should contain an 'impression' section; a precise diagnosis should be given when possible; a differential diagnosis should be provided when appropriate; follow-up or additional diagnostic studies to clarify or confirm the impression should be suggested when appropriate; and any significant patient reaction should be reported. Standardised computer-generated template reports that satisfy these criteria are considered to conform to these guidelines [7]. Recently, the European Society of Radiology (ESR) issued its own guidelines on good practice for radiological reporting. These state that it can be argued that concise, consistent ordering of the report both reduces variation among reports and makes it easier for referrers who become familiar with the format to assimilate information. The broad categories that ESR identifies are clinical referral, technique, findings, conclusion and advice. For ESR, further study is required before they fully support structured reporting (SR) [8]. Most of the ACR and ESR guidelines are reflected in the suggestions in our survey. Radiologists are expected to be competent enough to produce a diagnosis or a suitably ordered differential diagnosis. Vague conclusions are rejected by clinicians, as are other expressions of a

perceived refusal to take responsibility. Clinicians are well aware which radiologists deliver helpful reports and which do not. The supposition of one respondent that many clinicians only read the conclusion of the report was not supported in the quantitative part of the COVER survey: only 2.4% of the clinicians entirely agreed with it, and just 20.7% partially, 23.1% in all [2].

It is remarkable that none of the respondents suggested concrete measures to improve the quality and efficiency of the conclusion, such as putting the conclusion before the descriptive part or putting the most relevant parts of the conclusion first. This confirms our hypothesis that respondents mainly made suggestions based on their own daily experience.

Some suggestions were conflicting, e.g. concerning SR. In line with the results of quantitative surveys [2, 9, 10], there seems to be a demand for easily accessible, neatly arranged reports. The use of templates was approved by some clinicians in this survey but questioned by others. While few suggestions are in favour of reporting in free text, the rigorous application of predetermined templates and a standard lexicon may be experienced as tedious and boring, and lacking an element of diversity, of entertainment. This element has to be taken into account when developing SR systems. However, if international guidelines for the content of reports in specific areas of interest exist, such as in the follow-up of tumours, they should be routinely applied.

Should all imaging studies be read double-blind? Double-blind reading is indeed mandatory in screening mammography. In teaching hospitals, supervision by radiologists of reports made by residents can be considered a form of second opinion, although it will seldom be double-blind. Considering the lack of radiologists in many countries and the high cost involved, in most medical centers double reading will be restricted to random samples in the interest of quality control.

Suggestions that radiologists should refrain from mentioning a histological diagnosis may reflect a lack of familiarity with today's advanced imaging techniques. Using a combination of magnetic resonance imaging, contrast-enhanced multislice CT and/or contrast-enhanced ultrasound, it is perfectly possible to characterise, for example, a number of soft tissue tumours. Radiologists have to communicate about this more effectively, which can be done by actively engaging in continuing medical education initiatives for both GPs and specialists.

Clinicians, GPs especially, want radiologists to be available for direct consultation. It would indeed be practical if the report would mention explicitly how and where the radiologist can be reached. On the other hand, mentioning phone numbers in reports carries the risk of patients using the same communication lines. Although

some authors believe that reporting in the future will imply direct communication between radiologists and patients [11], in the interest of efficiency and privacy the two tracks need to remain separate. Efficient communication lines between radiologists and clinicians also imply reciprocity. Especially in large institutions with many residents-in-training, the direct phone number or the pager of the referring physician should be on every request.

Another important element is that clinicians apparently want to know where exactly abnormal findings can be seen. Many radiologists already include references to specific images. Back in the days of roentgen films, radiologists used to practice ‘sagittal reporting’ [12], marking important findings with an arrow. While digital imaging should have made such markings much easier (and less messy), their application seems to have largely faded away. Radiologists should consider readopting a modern version of the old habit. Despite a clear demand for more on behalf of some GPs, elucidating findings should be done with moderation. The radiology report is there to provide adequate and accessible diagnostic information, not to replace a refresher course on radioanatomy.

In the course of the last decade, several authors have published quantitative results of surveys among referring clinicians on the radiology report [2, 9, 10, 13, 14]. Such quantitative research can demonstrate the relative weight of predetermined expressions within the research population. It is however unable to grasp ideas and emotions outside of predefined frames. That is why when designing the COVER study we reserved space for suggestions in free text.

Open questions lead to open answers. Freed from the chains of preset forms and phrases, some respondents in our survey tended to stray off the subject. Many suggestions therefore had less to do with the radiology report as such, and more to do with communication between radiologists and clinicians in a broader sense.

Our methodology did have its limitations. Topics presented in the quantitative part of the COVER survey may have had some influence on the spontaneous suggestions made afterwards. This could have been avoided by putting the suggestions section first, but we were afraid that too many potential participants would have dropped out if the survey had started with open questions.

One cannot expect respondents to express an overarching view of the radiology report in a few lines. Most likely, they will express views that spring to mind most easily, maybe due to their emotional value or to recent personal experiences. Some of these suggestions may reflect local circumstances with little or no significance elsewhere, and suggestions from different respondents may even be conflicting. Many suggestions however concurred and were quite relevant. Therefore, we believe that they can contribute to a better insight into the ideas and emotions

of referring clinicians and have to be taken into account when rethinking the report.

Conclusion

Does the radiology report in its present form meet the expectations of referring clinicians? The fact that a considerable number of respondents of the COVER trial, 233 out of 735 (31.7%), made concrete suggestions for its improvement certainly shows that radiologists need to look critically at their end product. The most frequent suggestions however pertained to the position of the radiologist as a well-informed clinical specialist, and this implies an engagement from both sides.

How can the report, and in a broader sense the communication between radiologists and referring clinicians, be improved? There seems to be a need for well-structured, concise but complete reports without verbosity. Both radiologists and clinicians should be more easily available to one another for consultation. In specific situations such as follow-up of solid tumours, international guidelines should determine the structure and content of the report.

We do not pretend to provide the definitive answer to all questions concerning the quality of the radiology report. However, although the spontaneous suggestions in this study were erratic and sometimes contradictory, they do give an overview of the ideas as well as the emotions of these clients of the radiology department. We therefore believe it is highly advisable to take them into account when developing new ways of reporting.

Acknowledgements The authors wish to thank Hendrik R.M. Degryse, M.D.; Roelof E. Fokkema, M.D., Ph.D.; Guy J. Marchal, M.D., Ph.D., M.Sc.; Marijke Roosendaal, M.D.; Erik A.J. Schoonen, M.Sc.; Geert J.M. Smits, Ph.D.; Jan H. Teuwen, M.D.; Hilde Vandenhout, M.Sc., Ph.D.; and Lucille Weinberger, B.A.

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