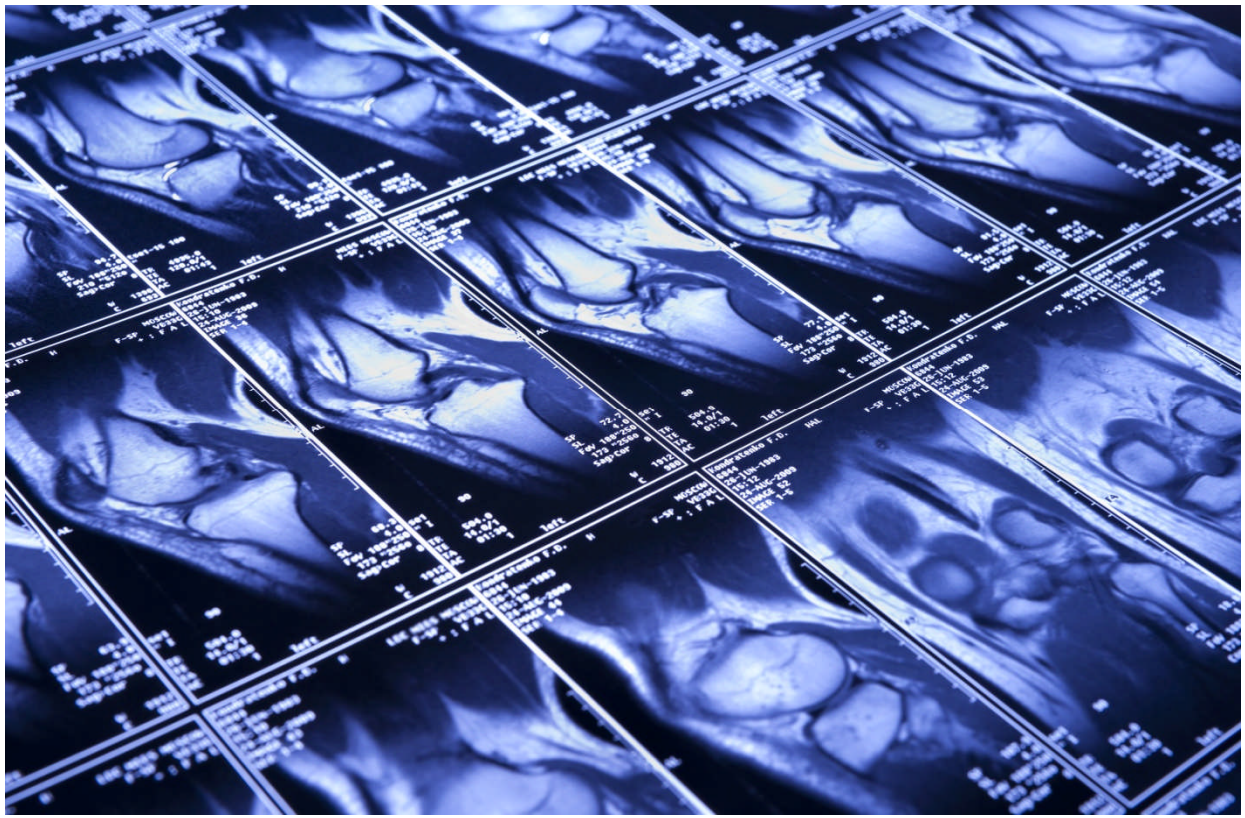
Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

ABSTRACT

EXTREMITY-ONLY MRI



Belgian Health Care Knowledge Centre

The Belgian Health Care Knowledge Centre (KCE) is an organization of public interest, created on the 24th of December 2002 under the supervision of the Minister of Public Health and Social Affairs. KCE is in charge of conducting studies that support the political decision making on health care and health insurance.

Executive Board

	Actual Members	Substitute Members
President	Pierre Gillet	
CEO - National Institute for Health and Disability Insurance (vice president)	Jo De Cock	Benoît Collin
President of the Federal Public Service Health, Food Chain Safety and Environment (vice president)	Dirk Cuypers	Christiaan Decoster
President of the Federal Public Service Social Security (vice president)	Frank Van Massenhove	Jan Bertels
General Administrator of the Federal Agency for Medicines and Health Products	Xavier De Cuyper	Greet Musch
Representatives of the Minister of Public Health	Bernard Lange	Brieuc Van Damme
	Bernard Vercruysse	Annick Poncé
Representatives of the Minister of Social Affairs	Lambert Stamatakis	Vinciane Quoidbach
	Ri De Ridder	Koen Vandewoude
Representatives of the Council of Ministers	Jean-Noël Godin	Philippe Henry de Generet
	Daniël Devos	Wilfried Den Tandt
Intermutualistic Agency	Michiel Callens	Frank De Smet
	Patrick Verertbruggen	Yolande Husden
	Xavier Brenez	Geert Messiaen
Professional Organisations - representatives of physicians	Marc Moens	Roland Lemye
	Jean-Pierre Baeyens	Rita Cuypers
Professional Organisations - representatives of nurses	Michel Foulon	Ludo Meyers
	Myriam Hubinon	Olivier Thonon
Hospital Federations	Johan Pauwels	Katrien Kesteloot
	Jean-Claude Praet	Pierre Smiets

	Social Partners	Rita Thys	Leo Neels
		Paul Palsterman	Celien Van Moerkerke
	House of Representatives	Lieve Wierinck	
Control	Government commissioner	Yves Roger	
Management	General director	Raf Mertens	
	Deputy general director	Christian Léonard	
	Program Management	Kristel De Gauquier	

Contact

Belgian Health Care Knowledge Centre (KCE)
Doorbuilding (10th Floor)
Boulevard du Jardin Botanique, 55
B-1000 Brussels
Belgium

T +32 [0]2 287 33 88
F +32 [0]2 287 33 85
info@kce.fgov.be
http://www.kce.fgov.be

KCE REPORT 205Cs
HEALTH SERVICES RESEARCH

Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

ABSTRACT

EXTREMITY-ONLY MRI

MARIJKE EYSSEN, MATTIAS NEYT, IMGARD VINCK, FRANK HULSTAERT

COLOPHON

Title:	Extremity-only MRI - abstract
Authors:	Marijke Eyssen (KCE), Mattias Neyt (KCE), Imgard Vinck (KCE), Frank Hulstaert (KCE)
Reviewers:	Caroline Obyn (KCE), Stefaan Van de Sande (KCE)
External experts:	Bénédicte Daenen (CHC), Tom Dresselaers (KULeuven), Hilde Engels (RIZIV – INAMI), Wouter Huysse (UGent), Stanislav Pargov (CHU-Brugmann), Marc Pouillon (GZA), Nils Reynders-Frederix (FOD Volksgezondheid – SPF Santé Publique), Maryam Shahabpour (UZ Brussel), Bruno Vande Berg (UCL)
External validators:	Prof. Dr. Jan Gielen (UZA), Dr. Edwin Oei (Erasmus MC, Rotterdam, Nederland and Stanford University, CA, USA), Dr. Dominique Tessier-Vetzel (Haute Autorité de santé (HAS), Paris, France)
Other reported interests:	All experts active in clinical practice consulted within this report were selected because of their expertise in the field of magnetic resonance imaging (MRI). Therefore, by definition, these consulted experts have a certain degree of conflict of interest to the main topic of this report. Membership of a stakeholder group on which the results of this report could have an impact: Tom Dresselaers (ISMRM, ESMRMB), Jan Gielen (KBVR) A grant, fees or funds for a member of staff or another form of compensation for the execution of research: Tom Dresselaers (FWO) Payments to speak, training remuneration, subsidised travel or payment for participation at a conference: Tom Dresselaers Participation in scientific or experimental research as an initiator, principal investigator or researcher: Tom Dresselaers
Layout:	Ine Verhulst

Publication date:	23 September 2013
Domain:	Health Services Research (HSR)
MeSH:	Magnetic Resonance Imaging; extremities
NLM Classification:	WN 185
Language:	English
Format:	Adobe® PDF™ (A4)
Legal depot:	D/2013/10.273/50

How to refer to this document? Eyssen M, Neyt M, Vinck I, Hulstaert F. Extremity-only MRI- abstract. Health Services Research (HSR) Brussels: Belgian Health Care Knowledge Centre (KCE). 2013. KCE Reports 205C. D/2013/10.273/50.

This document is available on the website of the Belgian Health Care Knowledge Centre.

FOREWORD

Paul Lauterbur and Peter Mansfield won the Nobel Prize for Medicine in 2003 for their groundbreaking work on magnetic resonance imaging (MRI), also known as nuclear magnetic resonance (NMR) or magnetic resonance tomography. Using very powerful magnetic fields, advance mathematics and massive computer power, they were able to obtain precise images of soft tissues, without, in contrast to the 'normal' CT scan, ionising radiation. Initial applications were mainly in oncology, but the technology is fast evolving, and today it is also being applied to indicate musculoskeletal disorders.

The question that followed logically was whether the smaller MRI unit, suitable for making images of a limb, might be a solution to the high demand and long waiting lists associated with the big whole-body MRI scanner. It could also deliver savings, in view of the lower investment costs for the smaller, so-called extremity-only MRI scanners.

However, things are often less simple than they first appear. The smaller units so far are not delivering a convincing quality of imaging, and the actual demand for it in this country appears difficult to determine. Besides, a useful answer to the question can only be formulated in the wider context of medical imaging as a whole. Which brings us to the problem of the high radiation dosage delivered to the Belgian patient, who of course is no stranger to the (over)use of CT scans.

So what initially appeared to be a simple technical question becomes a series of recommendations that cover the wider field of imaging. This of course is embedded in the specific funding system of Belgian health insurance, with the familiar consequences for the use and quality of care provision. But that's another story.

Christian LÉONARD
Deputy general director

Raf MERTENS
General director

ABSTRACT

THE (UNKNOWN) POTENTIAL OF EMRI

Dedicated extremity-only MRI (eMRI) systems were designed to visualize limbs by means of magnetic resonance imaging. The list of MRI indications indeed includes many musculoskeletal conditions confined to the extremities. The extremity-only device is cheaper than a whole-body MRI, it appears to be less frightening for claustrophobic patients, the position could be more comfortable for patients and the noise level of the machine is lower. An important advantage of MRI over CT is the absence of ionising radiation.

Magnetic field strength of clinical MRI scanners, expressed in Tesla (T), can vary considerably. Scanners are often categorised as low-field (≤0.5T), mid-field (>0.5T - <1.5T) or high-field (≥1.5T) devices. Higher field strength permits to reduce acquisition time at a given spatial resolution (lowering the incidence of motion artefacts) or to improve spatial representation at a given acquisition time. At present, most MRI exams in Western countries are performed using whole body MRI scanners with a field strength of 1.5 to 3.0 Tesla.

In Belgium, it is obliged by law to install MRI-units in a hospital environment. In order to operate an MRI-unit and to qualify for subsidies from the federal public service Public Health and for reimbursement from the compulsory health insurance, a hospital has to meet certain accreditation criteria defined by the federal government. In addition, the federal government also restricted (“programmed”) the total number of MRI-units for each region and the number of MRI scanners per unit. For the purpose of programmation, no distinction is made between extremity-only and whole-body MRI scanners. To our knowledge, there is currently no eMRI installed in Belgium.

In view of the existing waiting lists, the initial question raised by the Federal Public Service (FPS) Health was to what extent limb scans using whole-body MRI scanners could be replaced by (high field strength) extremity-only MRI scanners. The research team looked for evidence in the literature and contacted several experts to answer this question.

It appears that currently there is insufficient evidence to support this hypothesis.
Firstly, according to the consulted experts, eMRI indications would only account for a limited percentage of all MRIs performed, but their opinion may be centre-specific. No hard data on volume by indication are available to substantiate this statement.
Next, the substitution potential also depends on the diagnostic accuracy of eMRI for these indications. To clarify this question, additional diagnostic evaluation studies are required to investigate whether low/mid/high-field MRI devices can provide sufficient diagnostic information for those specific indications.

A limited literature review was performed in July 2013, searching for existing systematic reviews (SRs) or meta-analyses in a.o. Medline, CDSR (Cochrane Database of Systematic Reviews), and CRD (Centre for Reviews, and Dissemination) database. Two literature reviews were found eligible: a report of the Agency for Healthcare Research and Quality (AHRQ, 2011), and a report of the Haute Authorité de Santé (HAS, 2012). This was complemented with a search for RCTs in August 2013. However, there was not enough evidence to support or refute the use of low-field or mid-field eMRI. In our search for evidence, special attention was given to studies directly comparing diagnostic efficacy between high-field eMRI (≥1.5T) and conventional high-field whole-body MRI. We did not find such studies.

In theory, high-field eMRI devices could be assumed to have the same diagnostic efficacy as high-field whole-body MRI, if they are fitted with comparable peripheral equipment (gradient system, radio frequency coil system, computer program…). However, high-field eMRI is currently not used in Belgium and according to the consulted experts, the algorithms would deserve further optimization, and additional research is needed to clarify its potential.

(E)MRI IN A BROADER BELGIAN MEDICAL IMAGING CONTEXT

Our study results should be combined with important findings from previous studies and initiatives.

In 2006 the Belgian Superior Health Council (Hoge Gezondheidsraad/ Conseil Supérieur de la Santé) reported that the X-ray exposure based on medical imaging in Belgium was about half of the overall exposure, and 4 to 5 times higher compared with the Netherlands and the UK.

In 2009, the Intermutualistic Agency (IMA) published a report on medical imaging in Belgium, based on data from the “permanent sample”, and covering the period 2002 to 2008. There was a.o. a strong upward trend for CT (+12.7% yearly) and MRI (+9.4% yearly). The authors concluded that the awareness of the radiation risks and the acquaintance with the guidelines for medical imaging could improve among prescribers. According to these guidelines, for several indications, either CT is not indicated or MRI is a superior, non-ionizing alternative for CT.

In 2012, the Belgian College of Radiology published the results of a prospective multicentre study on the compliance with the recommendations for medical imaging in Belgium and explored the correlation between the clinical pathology presented by the patient, and the medical imaging examinations prescribed by the physicians referring their patient. Based on the study sample (including 792 referrals) and the selected pathologies, there was a large potential for decreasing the number of X-rays (-108) and CTs (-203) versus a small increase in MRI (+27). While this study illustrates the necessary trend towards less CT and (slightly) more MRI, it does not, however, enable to define the potential of eMRI, since it does not include the specific indications for which eMRI would be applicable.

In 2010, the National Institute for Health and Disability Insurance RIZIV/INAMI in collaboration with FPS Health launched a campaign to make physicians more aware of the guidelines and steer their prescribing behaviour. Furthermore, from 1 March 2013 onwards, the request form for medical imaging is standardized and must contain a.o. the diagnostic problem and the clinical elements needed to clarify the clinical context for the radiologist. The primary aim of this standardized form is to enhance the communication between the prescriber and the radiologist in order to ensure that every patient gets the most appropriate type of medical imaging. Ideally, the information from the standardised form should be captured in a central database. This could support further research in e.g. the necessary capacity for imaging techniques, and thus potential for eMRI.

For more details on these and other Belgian initiatives in the domain of medical imaging, see full version of the report.

CONCLUSIONS

In theory and according to the consulted experts, eMRI can produce images of comparable quality to those from regular MRI systems of similar magnetic field strength. Evidence on the comparative accuracy of eMRI versus whole-body MRI is however lacking. According to several of the consulted experts, the volume of specific eMRI indications would be small compared to the total volume of MRI indications, and eMRI would be no real solution to the problem of waiting lists in most hospitals. Information on the appropriate (e)MRI volume per indication is however missing.

Inappropriate imaging prescriptions persist to be a matter of concern in Belgium, especially the over-prescription of CT scans, entailing a high exposure to ionizing radiation. As mentioned in the report of the College of Radiology, a better compliance with the guidelines would immediately lead to an increase in the quality of medical imaging, and to a decrease of radiation exposure and of health insurance expenditures.

RECOMMENDATIONS[a]

To the Minister of Public Health and Social Affairs, the Insurance Committee and the Technical Medical Council of the RIZIV – INAMI (National Institute for Health and Disability Insurance) and the FPS Public Health

- **There is currently insufficient scientific justification for public funding of extremity-only MRI, either for low-field strength or high-field strength systems. The advice is to determine indications for eMRI (with low and high field strength) and the number of examinations that can be expected in the Belgian hospitals.**
- **The choice to perform imaging, the choice of technique and modality of imaging should be rendered financially neutral for the requestor, the operator and the care institution. A cost study may be of assistance in this matter.**
- **The role of the radiologist in the choice to perform imaging and the most appropriate imaging technique should be strengthened, but this should be accompanied by the above-mentioned financial neutrality.**
- **Monitoring of a more correct prescribing behaviour is necessary. This can be obtained by a central registration of the requested technique and the indication, by means of a standard electronic request form. A more detailed nomenclature would only offer a partial solution.**
- **For a number of problems, these measures should lead to a shift from CT scan to MRI investigations, and a reduction of the total radiation dosage. A reinvestment from CT to MRI is recommended here.**

To the scientific associations of radiologists and the National Council for Quality Promotion

- **The care providers should continue to receive better information regarding the appropriate imaging technique for every common problem. This could be achieved by compulsory continued education.**

Research agenda

- **A cost study should be carried out with the purpose of arriving at funding that is neutral to the choice to perform imaging, choice of technique and modality of imaging.**
- **A feasibility study into central electronic registration of all imaging including technique and indication is advised.**

[a] The KCE has sole responsibility for the recommendations.