The Pangea Project
Health Expenditures Across the Globe

Health care cost as percent of GDP (total economy of a nation).[1]

Total health expenditure per capita in US dollars (PPP). This chart breaks it down further by public and private expenditures.[9]
Study documents decline in imaging use since 2001

Dr. Laurence Parker and Dr. Vijay Rao & Charles Palit, PhD
Health Affairs, April 2017, Vol.36:4, pp. 663-670

<table>
<thead>
<tr>
<th>Test Type</th>
<th>2001</th>
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<th>2009</th>
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<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<tr>
<td>CT</td>
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<td>625</td>
<td>637</td>
<td>626</td>
<td>500</td>
<td>498</td>
<td>500</td>
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<td>Echocardiography</td>
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<td>656</td>
<td>257</td>
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<td>251</td>
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<td>MRI</td>
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<td>183</td>
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<td>Noncardiac ultrasound</td>
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<td>428</td>
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<td>441</td>
<td>438</td>
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<tr>
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<td>296</td>
<td>285</td>
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<td>110</td>
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<td>93</td>
<td>87</td>
</tr>
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</table>

*Rates in bold represent years in which code bundling was implemented.*
Projecting a bright future for Nuclear Medicine

- Nuclear medicine/radiopharmaceuticals market: USD 7.27 Billion by 2021 from USD 4.67 Billion in 2016, growing at a CAGR of 9.3%

- Growth factors: 
  - increasing number of chronic diseases like cancer,
  - development of alpha radiotherapy and
  - investments through public-private partnerships.

- The diagnostic radiopharmaceuticals segment: 
  - largest share of the GM
  - highest CAGR.

- production of MO-99 in the U.S.,
- approval of radiopharmaceuticals by the FDA,
- new irradiation facility in Germany,
- installation of PET scanners in India, PET/MR in China
- investments by the government in the Rest of Asia-Pacific,
- initiatives of IAEA
Projecting a bright future for Nuclear Medicine

✵ SPECT applications segment: ☛ largest share of the global market.

✵ PET segment: ☛ highest growth rate in the forecast period.

➢ advances in PET imaging techniques and equipment
➢ introduction of new PET radiotracers,
➢ desired choice for diagnosis.

✵ Asia-Pacific region: ☛ largest share of the GM

➢ highest growth

➢ installations of PET scanners and increased production of radiopharmaceuticals for therapeutic purposes in India,
➢ installations of PET/MR in China
➢ aging population,
➢ high healthcare expenditure in Japan and China, and
➢ initiatives by the Australian government.
RESOURCES in NM EDUCATION

1. NM Medical Professional Organizations (specialty)
   1. World
   2. Continents/”Multinational”
   3. National
   4. Chapters/Local

2. NM Industry (technology/radiopharmaceuticals)

3. Governments Agencies (disease)

4. Hospitals/Medical Centers (disease, technology)

5. Patients Organizations (disease)
Education in Nuclear Medicine for NM Professionals
PET-based radiomics have been used to noninvasively quantify the metabolic tumor phenotypes; however, little is known about the relationship between these phenotypes and underlying somatic mutations.

AIM OF THE STUDY: assessed the association and predictive power of 18F-FDG PET-based radiomic features for somatic mutations in NSCLC patients.

METHODS: 348 NSCLC patients underwent diagnostic 18F-FDG PET scans and were tested for genetic mutations. Thirteen percent (44/348) and 28% (96/348) of patients were found to harbor epidermal growth factor receptor (EGFR) or Kristen rat sarcoma viral (KRAS) mutations, respectively.

Evaluation of 21 imaging features: 19 independent radiomic features quantifying phenotypic traits and 2 conventional features (metabolic tumor volume and maximum SUV).

Statistics The ability of each imaging feature to predict mutation status was evaluated by the area under the receiver operating curve (AUC) and its significance was compared with a random guess (AUC = 0.5) using the Noether test. All P values were corrected for multiple hypothesis testing by controlling the false-discovery rate (FDRWilcoxon, FDRNoether) with a significance threshold of 10%.

RESULTS: ➤ radiomic features and both conventional features were significantly associated with EGFR mutation status (FDRWilcoxon = 0.01-0.10).
➤ 1 radiomic feature (normalized inverse difference moment) outperformed all other features in predicting EGFR mutation status (EGFR+ vs. EGFR-negative, AUC = 0.67, FDRNoether = 0.0032), as well as differentiating between KRAS-positive and EGFR+ (AUC = 0.65, FDRNoether = 0.05).
➤ None of the features was associated with or predictive of KRAS mutation status (KRAS-positive vs. KRAS-negative, AUC = 0.50-0.54).

CONCLUSION: ➤ Our results indicate that EGFR mutations may drive different metabolic tumor phenotypes that are captured in PET images, whereas KRAS-mutated tumors do not.
➤ This proof-of-concept study sheds light on genotype-phenotype interactions, using radiomics to capture and describe the phenotype, and may have potential for developing noninvasive imaging biomarkers for somatic mutations.
Low Readability Factor

Readability is the ease with which a reader can understand a written text.

In natural language, the readability of text depends on
• its content (the complexity of its vocabulary and syntax) and
• its presentation (such as typographic aspects like font size, line height, and line length)
• the educational level of the reader

Numerous readability formulas estimators for different audience

Health Literacy

Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.

Health literacy is dependent on individual and systemic factors: Communication skills of lay persons and professionals.

What are the consequences of poor health literacy?

• Patients with limited health literacy skills are less likely to:
  → understand information from doctors or nurses.
  → act on medication directions and appointment schedules.
  → navigate the health system to obtain the services they need.

• Patients with limited health literacy skills are more likely to:
  → have ongoing, chronic illnesses.
  → visit the hospital and go to the emergency room.
  → have higher health care costs than people with better health literacy skills
Health Literacy

U.S. Report Card on Health Literacy

- Nearly nine out of ten adults may lack the skills needed to manage their health and prevent disease.

- Almost 36% of the U.S. population can only perform simple literacy tasks such as finding a program in a TV guide.

- One out of five American adults reads at the 5th grade level or below, yet most healthcare materials are written above the 10th grade level.
# Health Literacy

## Table 1. Overview of the NAAL Health Literacy Tiers

<table>
<thead>
<tr>
<th>Tier</th>
<th>Percentage of the U.S. population</th>
<th>Examples of key abilities</th>
<th>Associated health tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below basic</td>
<td>14</td>
<td>Able to locate only straightforward pieces of information in short, simple texts or documents; some patients have even less ability because of nonliteracy in English</td>
<td>Find the date on a hospital appointment slip; identify what is permissible to drink before a medical test based on a short set of instructions</td>
</tr>
<tr>
<td>Basic</td>
<td>22</td>
<td>Find more complex information in short texts and simple documents that are somewhat longer and more complex than those at the below basic level</td>
<td>Give 2 reasons a person with no symptoms of a specific disease should be tested for the disease using information from a patient education handout</td>
</tr>
<tr>
<td>Intermediate</td>
<td>53</td>
<td>Interpret or apply information presented in complex graphs, tables, or other health-related texts or documents</td>
<td>Determine a healthy weight range for a person of a specified height, based on a graph that relates height and weight to body mass index; identify substances that may have an adverse interaction with an over-the-counter drug using information on a drug label</td>
</tr>
<tr>
<td>Proficient</td>
<td>12</td>
<td>Draw abstract inferences, comparing or contrasting multiple pieces of information within complex texts or documents, or apply abstract or complicated information from texts or documents</td>
<td>Evaluate applicability of a legal document in a specific health care situation; calculate an employee’s share of annual health insurance costs using a table that shows how the cost varies based on income and family size</td>
</tr>
</tbody>
</table>

NAAL = National Assessment of Adult Literacy.

Information from reference 2.
RESOURCES in NM EDUCATION

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4. Hospitals/Medical Centers (disease, technology)

5. Patients Organizations (disease)
Diseases and Conditions

Pulmonary embolism

By Mayo Clinic Staff

What to expect from your doctor

During the physical exam, your doctor might inspect your legs for evidence of a deep vein clot — an area that’s swollen, tender, red and warm. He or she will also listen to your heart and lungs and check your blood pressure.

Pulmonary embolism can be difficult to diagnose, especially in people who have underlying heart or lung disease. For that reason, your doctor may order a series of tests to help find the cause of your symptoms. Your doctor may order one or more of the following tests.

Blood tests

Your doctor may order a blood test for the clot-dissolving substance D dimer in your blood. High levels may suggest an increased likelihood of blood clots, although D dimer levels may be elevated by many other factors, including recent surgery. In addition, blood tests may be done to determine whether you have an inherited clotting disorder.

Chest X-ray

This noninvasive test shows images of your heart and lungs on film. Although X-rays can't diagnose pulmonary embolism and may even appear normal when pulmonary embolism exists, they can rule out conditions that mimic the disease.

Ultrasound

A noninvasive "sonar" test known as duplex ultrasonography (sometimes called duplex scan, or compression ultrasonography) uses high-frequency sound waves to check for blood clots in your thigh veins. In this test, your doctor uses a wand-shaped device called a transducer to direct the sound waves to the veins being tested. These waves are then reflected back to the transducer and translated into a moving image by a computer. The absence of the presence of clots reduces the likelihood of DVT. If the upper thigh vessels are clear, the ultrasonography will also scan the veins behind the knee looking for residual clots. If clots are present, treatment likely will be started immediately.

CT scan

Regular CT scans take X-rays from many different angles and then combine them to form images showing 2-D "slices" of your internal structures. In a spiral (helical) CT scan, the scanner rotates around your body in a spiral — like the stripe on a candy cane — to create 3-D images. This type of CT can detect abnormalities within the arteries in your lungs with much greater precision, and it's also much faster than are conventional CT scans. In some cases, contrast material is given intravenously during the CT scan to outline the pulmonary arteries.

Pulmonary angiogram

This test provides a clear picture of the blood flow in the arteries of your lungs. It's the most accurate way to diagnose pulmonary embolism, but because it requires a high degree of skill to administer and has potentially serious risks, it's usually performed when other tests fail to provide a definitive diagnosis.

In a pulmonary angiogram, a flexible tube (catheter) is inserted into a large vein — usually in your groin — and threaded through into your heart and on into the pulmonary arteries. A special dye is then injected into the catheter, and X-rays are taken as the dye travels along the arteries in your lungs.

One risk of this procedure is a temporary change in your heart rhythm. In addition, the dye may cause kidney damage in people with decreased kidney function.

MRI

MRI scans use radio waves and a powerful magnetic field to produce detailed images of internal structures. Because MRI is expensive, it's usually reserved for pregnant women (to avoid radiation to the fetus) and people whose kidneys may be harmed by dyes used in other tests.

Treatment is aimed at keeping the blood clot from getting bigger and preventing new clots from forming. Prompt treatment is essential to prevent serious complications or death.
STAKEHOLDERS

1. NM Professionals

2. Hospitals/Medical Centers Administrative Personnel

3. Local/Regional/Provincial/State/Federal Governments Agencies

4. Non NM Professionals

5. Patients
Dr. Amen’s Love Affair with SPECT Scans

Functional Neuroimaging Distinguishes Posttraumatic Stress Disorder from Traumatic Brain Injury in Focused and Large Community Datasets

Daniel G. Amen, Cyrus A. Raji, Kristen Willeumier, Derek Taylor, Robert Tarzwell, Andrew Newberg, Theodore A. Henderson

Published: July 1, 2015 • http://dx.doi.org/10.1371/journal.pone.0129659

Amen Clinic’s Research is
#19 of Discover’s
100 Top Stories of
Science 2015

READ MORE
ONE PICTURE, 1000 WORDS
“Magazine Le Patient”

1. **The Origin**: Montréal, Quebec, by Dr. F. Lamoureux

2. **It’s mission**: To promote and educate medical professional on interdisciplinary practices.

3. **Distribution network**: 80,000 copies +/yearly and 10,000 web access/monthly

http://www.lepatient.ca
What is the Pangea project? Connecting the world in one place.

Pangea Project

**Vision:** To provide a multilingual, unique, easy to understand, digital platform to educate patients and non nuclear medicine professionals about nuclear medicine, tools and procedures.

**Mission:** Educate patients and non nuclear medicine professionals on the safe use of medical isotopes for diagnostic and therapeutic purposes to improve patients’ health across the globe with the help of a digital publications
Using the power of the internet, digital communications tools and social media, the PP creates a **reliable information resource** about nuclear medicine accessible to the **general public and referring professionals across the globe**.
Choosing the right Platform

- Word press is the most popular open source Content Management System (CMS) used in 73 million websites.
- It meets the demand of many users with its flexible framework to allow designers and developers to create and modify layouts and applications.
- Components are user-friendly.
- Lower cost in comparison to other Open Source CMS.
Choosing the right branding

* To make sure we get the positioning and the notoriety we want with the Pangea project, we team-up with a bright and young web agency to develop our brand.

PAR DESIGN – Web Agency
https://pardesign.net/

- They have the knowledge and experience
- They understand our goals and objectives
- Highly up to date in resent communication technologies.

Digital adaptability
Choosing the right content, E-Lepatient

Timeline - 2017

E-Lepatient, the Pangea project’s unique digital/electronic publication

The same quality publication

Collaboration of the world best specialist and experts

3 major topics
Nuclear Cardiology
Lung Scintigraphy
Radiation Exposure

With articles written by
Dr. Wei He, China
Dr. Fernando Mutt, Uruguay
Dr. Jean-Philippe, Vuillez, France
Dr. Jean-Luc Urbain, USA
Dr. Francois Lamoureux, Canada
Choosing the right distribution channels to reach our targets

The Pangea platform
- Data on nuclear medicine
- Articles/news
- Videos/imaging
- Pictures
- Statistics
- E-Lepatient

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- Nuclear Cardiology
- Lung Scintigraphy
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- Dr. Francois Lamoureux, Canada

The channels
- Via International partners (AIPES-SNNMI-EANM)
- Via Pangea’s data base
- Via the Website subscribers
- Via Pangea’s partners networks

Reaching our targets
- Email blast
- Daily updates
- Social media actions
- Connectivity with all devices
- Easy Access of Pangea’s platform

General public
Referring physician
The Pangea project

Thank you

Jean-Luc Urbain, Francois Lamoureux, Nicolas Lapierre