FOBIS: Business – cases and key observations

Oslo, October 31, 2006

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Topics

- Definitions and delimitation
- Cases – start-ups in medical sensors + consortium
  - Chempaq
  - Sense
  - Wireless Patch
- Some key figures for Denmark
- Nordic potential?

norden
Nordic Innovation Centre

The area

FOBIS

- Medical sensors: Sensors that in one way or another is incorporated in health care
- Biosensor: A sensor incorporating at least two processes. One is a biochemical reaction defining the specificity of the sensor; the other is the physical part that – as a consequence of a biomedical reaction – provides for a readout signal.
- E.g. a hearing aid device involves a sensor – but not a biosensor – and is used in order to overcome a medical deficiency. But
- an SPR sensor (Biacore) is a *biosensor*

Example 1: Chempaq

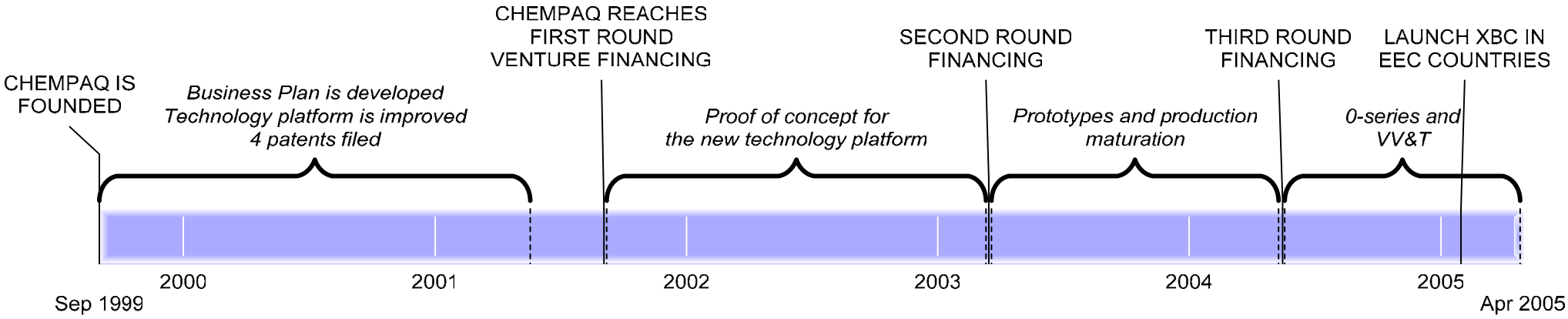
- A company based on research at the Technical Univ. of Denmark/MIC
- Point-of-care diagnostics at hospitals and GPs
- Very small sample is needed
- Very fast response
- Does require that the GP performs a test that othervise may be performed at a central laboratory

- Mostly in-house development of product and production
- Marketing close to end-users

Chempaq - Unique testing

History

CHEMPAQ A/S:
Founded in 1999
Employees: 20
Key shareholders: Five venture investors and Founder
Situated in Copenhagen, Denmark in Symbion Science Park
Sales: From March 2005: 100+ Readers and 30.000+ cassettes



Changing the paradigm of
- The Hematology test flow

By offering a simple 3 minute test providing:

- Total Leucocytes (WBC)
- Lymphocytes (LYM)
- Monocytes (MON)
- Granulocytes (GRN)
- Hemoglobin (HGB)

Requires only one droplet of undiluted capillary or venous blood sample.

Within hematology testing, technology hasn't changed for 50 years – until now!

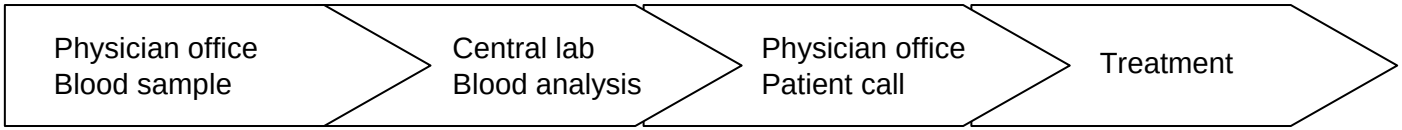
The shown instruments use the same basic technology

chempaq

Chempaq XBC

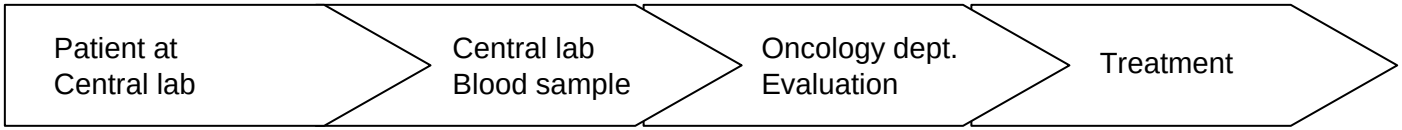
Today's "flow" of blood testing

Primary Care

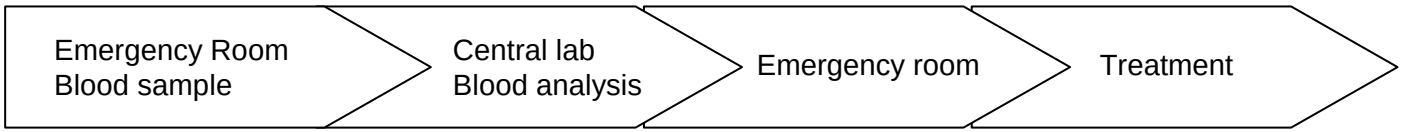


				Total
Duration:	½-1 day	½-2 days	0-1 day	1-4 days

Hospitals



Oncology:				
Duration:	½-2 hours	½-24 hours	1-3 hours	2-29 hours



ER:				
Duration:	½-2 hours	½-2 hours	0-1 hour	1-5 hours

The Chempaq XBC Solution offering

Statement	GP	Hospital
State-of-the-art performance	x	x
Simple/1-step analysis	x	x
Faster diagnosis/3 minutes	x	x
High user comfort	x	x
Low investment	x	x
Improved patient service	x	x
Total cost at equal level		x
Profit	x	
Efficiency – patient mngmt.	(x)	x

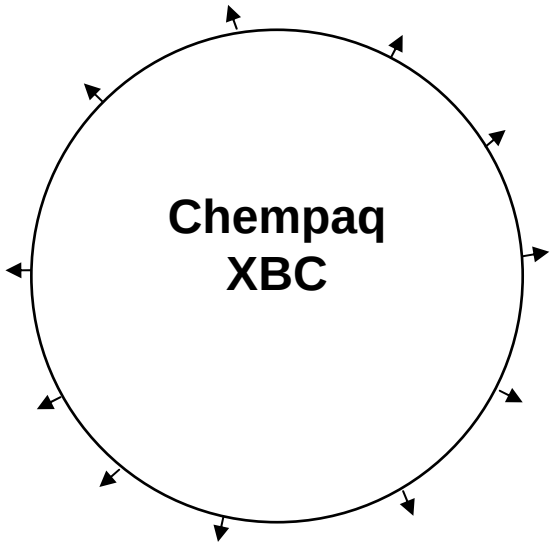
Reference to ”XBC concept and messages”

Broad application opportunities with the most commonly made/ordered blood tests

>500 mill. tests/year

Hospitals
- Critical Care
- Oncology
- Operating Rooms
- Neonatal units

Primary Care
- General Practice
- Pediatrics
- Internal Medicine



Home Care

Dialysis Clinics

Blood Banks

Nursing Homes

Surgical Centers

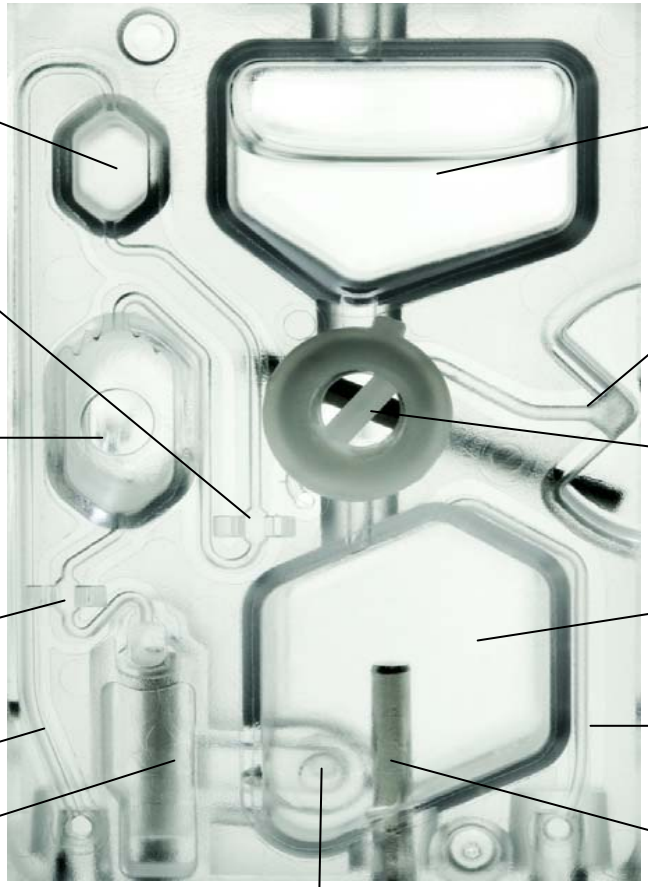
Visiting Nurses

Public Health
- Anemia screening/management
- Infection screening/management
- Cancer screening/management

National Accounts
e.g. Army, Navy, VA, Hospital Buying Group

National Screening Programs
- WHO
- UNICEF
- CDC

The PAQ Cassette concept



Example 2: Sense A/S

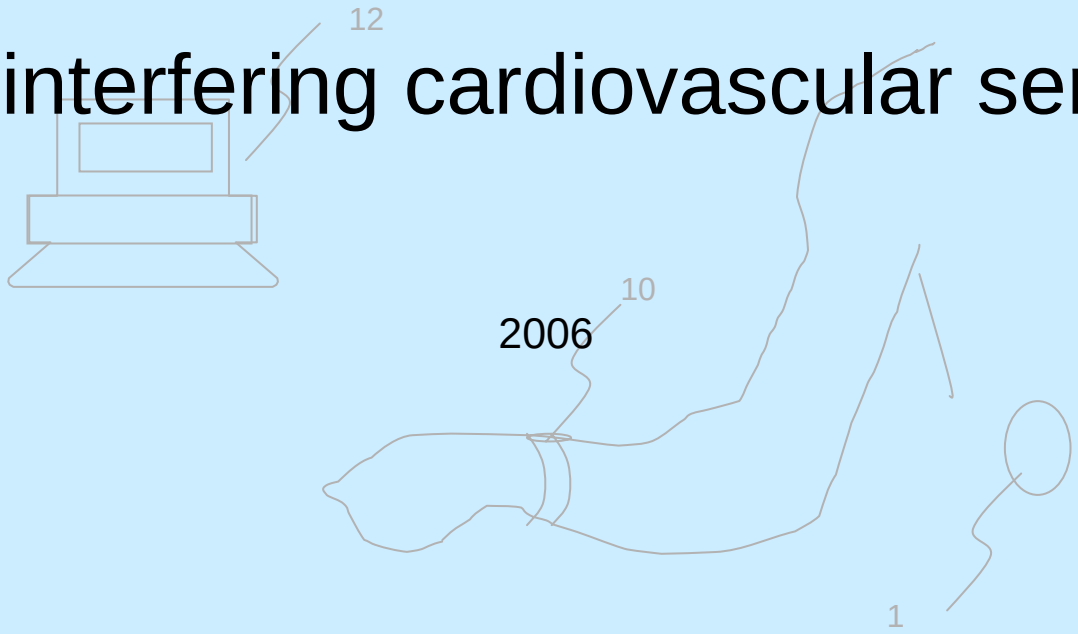
- A company based on research at STC, Risø, The Danish Technological Institute, and two hospitals
- Cardiovascular sensing
- Continuous blood pressure and non interfering
- A very preliminary state

✓ Very little is done in-house

? Based on an early 'exit'

Sense A/S

Non interfering cardiovascular sensing



Sense A/S

- Established on the basis of an idea for breast milk measurements
- A novel concept was devised and verified
- A large potential market – but uncertain of the customers would accept the product
- Cardiovascular measurements
- Wireless, low-cost, disposable sensor – a technology has been devised. (Patents applied for)
- Blood pressure is well established
- However, traditional methods do have important drawbacks: Non invasive but **not non interfering!**
- Continuous measurements during normal activity – including sleep.
- Little innovation among traditional vendors
- A substantial market
- Potentially a very attractive ROI

Some relevant concepts

A sensor:

- A device that provides information about the state of a physical system
- Compact and robust
- **Tailored to the environment - not the other way around**

Non invasive:

Does not penetrate any protecting membranes

Wireless:

No wires connected tot he sensor

Passive:

No batteries (or wired power connection)

Blood Pressure variations

Studiet viser således, at døgnblodtryk har en overlegen prognostisk værdi for død og kardiovaskulær sygdom i forhold til klinikblodtryk og godtgør anvendelsen af døgnblodtryksmåling også i den almindelige befolkning.

Læge Tine Willum Hansen:

Den prognostiske betydning af døgnblodtryk i befolkningen (ph.d. 2005)

Alle med hypertension bør om praktisk muligt før behandlingsstart have udført en døgnblodtryks- eller hjemmeblodtryksmåling for at vurdere, om patienten har betydende konsultationshypertension.

. . . solid dokumentation for at døgnblodtryk bedre prognosticerer kardiovaskulær morbiditet og mortalitet . . .

. . . natblodtrykket eller nat/dag ratio i nær fremtid vil blive indført som en parameter med klinisk betydning.

Lia E. Bang, Kent Lodberg Christensen, Klavs Würgler Hansen, Karin Skov & Niels Wiinberg: ***Diagnostisk blodtryksmåling - på døgnbasis, hjemme og i konsultationen****, Dansk Hypertensionsselskab 2006*

Search at PubMed (NIH) on ” Blood pressure variations” gave 3432 responses!

Blood Pressure – traditional instruments

Mercury sphygmomanometer

- May be bulky to carry.
- Mercury spills can be hazardous.
- Must be kept upright on a flat surface during measurement; the gauge must be read at eye level for accuracy.
- May not work well for the hearing or visually impaired or for those unable to perform the hand movement needed to squeeze the bulb and inflate the cuff.

Aneroid equipment

- Has a delicate and complicated mechanism.
- Less accurate than mercury sphygmomanometers and requires calibrating at least once a year or when dropped or bumped.
- Can be easily damaged without the user's knowledge and requires factory repair and readjustment.
- Gauge can be clumsy to position, and without a D-ring cuff can be difficult to apply by oneself.
- May not work well for the hearing or visually impaired or for those unable to perform the hand movement needed to squeeze the bulb and inflate the cuff.

(Source: American Heart Association)

Blood Pressure by Sense

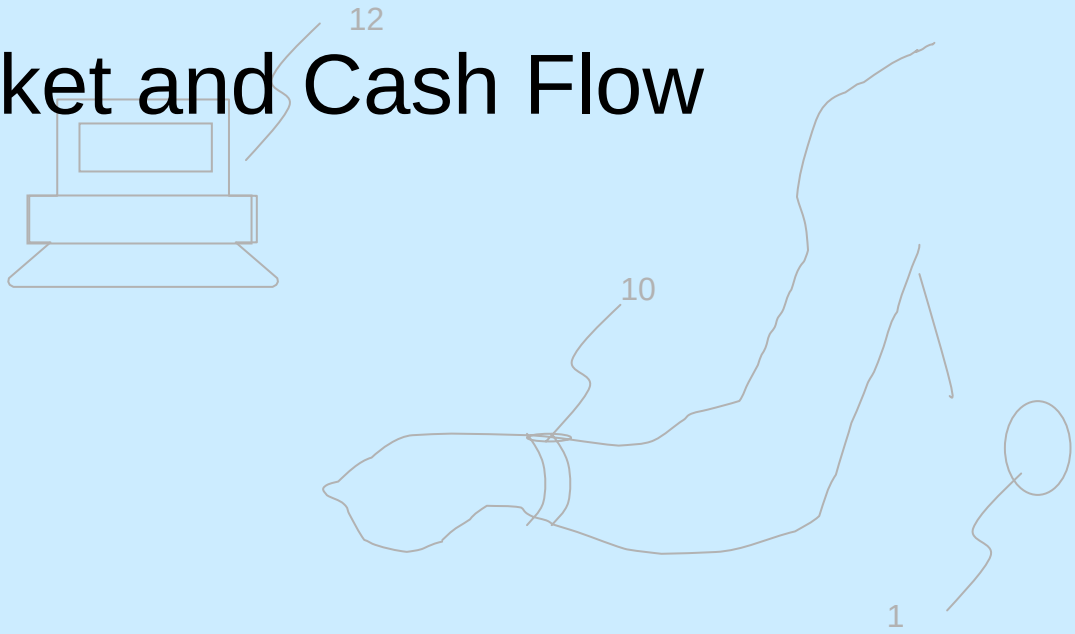
+ Non interfering (minimum)
+ Continuous
+ Wireless and passive sensor
+ Disposable sensor
+ Low cost of sensor
+ Measurements in a non-medical environment

- Calibration
- Mounting
- Obesity

Cardiovascular measurements

- Pulse
- Compliance
- Flow
- Composition (pulse oximetry)
- Blood Pressure

The Market and Cash Flow

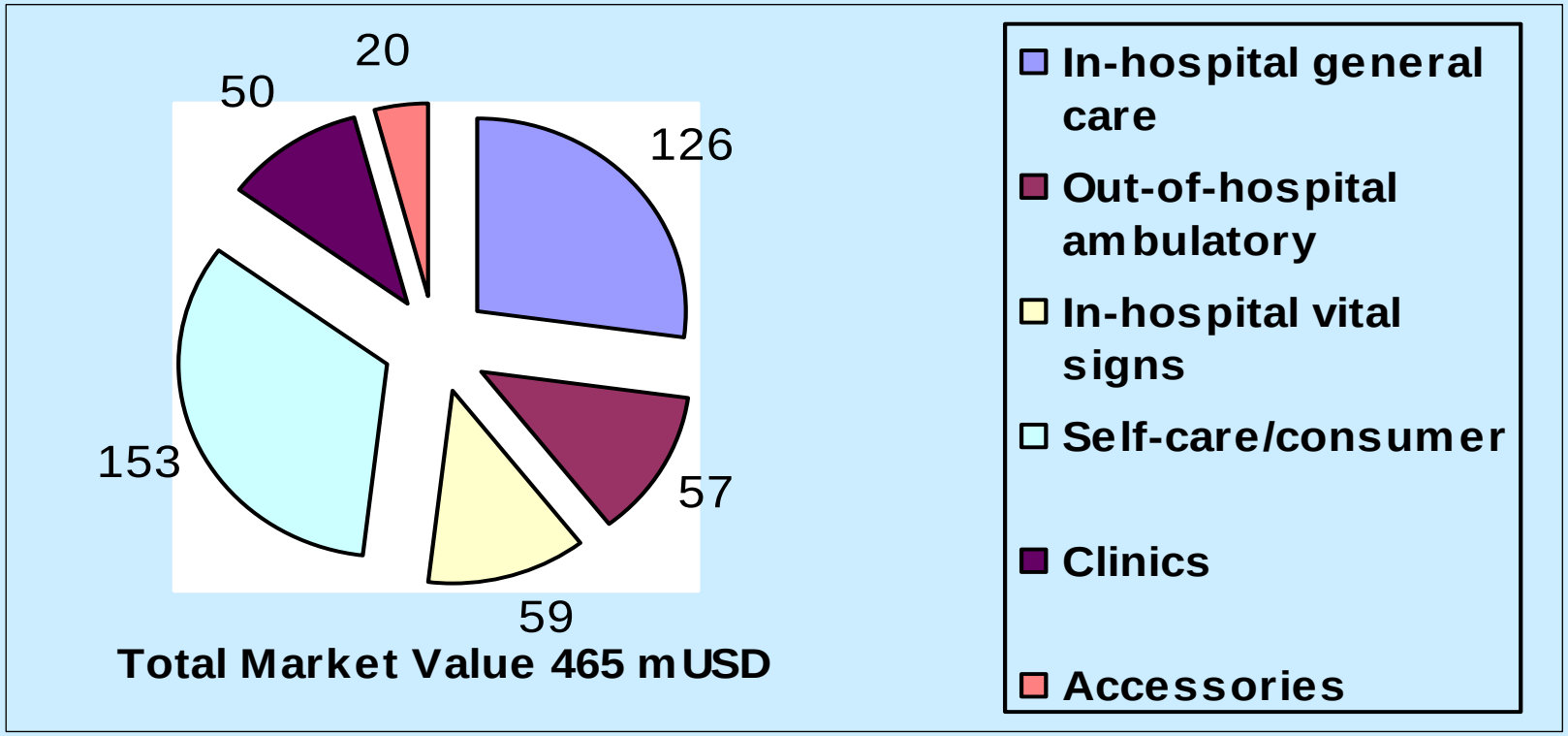


Welfare diseases

- Diabetes
- Cardiovascular
- Approaching one third of the population in the affluent part of the world – and also growing rapidly in less affluent parts

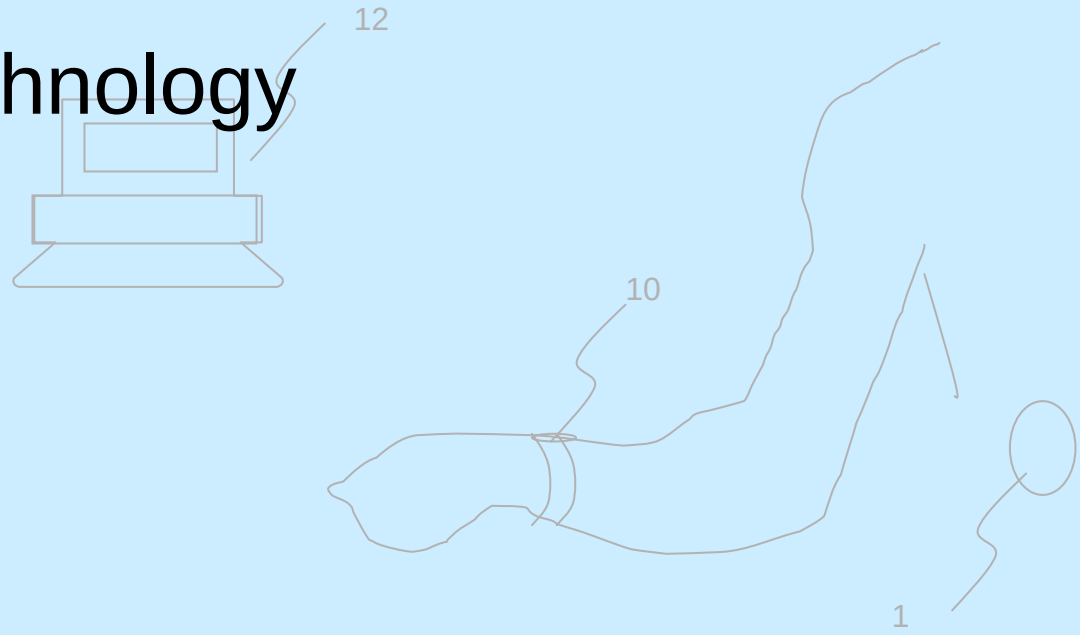
- Overall numbers are established
- The market structure is researched: user, decision making, reimbursement . . .
- How to approach the market: A novel product + a well established vendor of health care products

BP Market

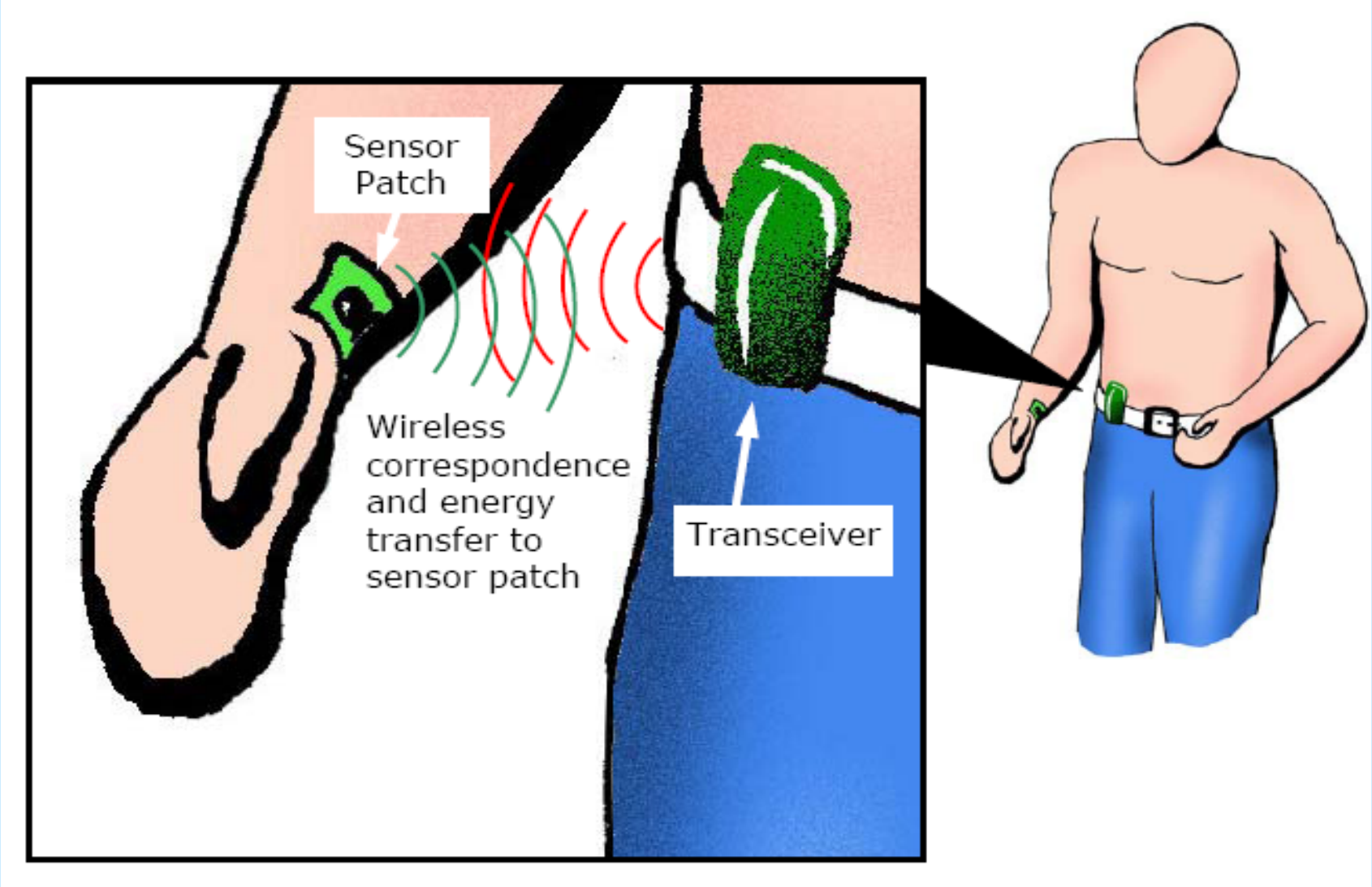


Susanne Friis: MBA project

The Technology



System lay-out



Verified + Risks

A compilation of

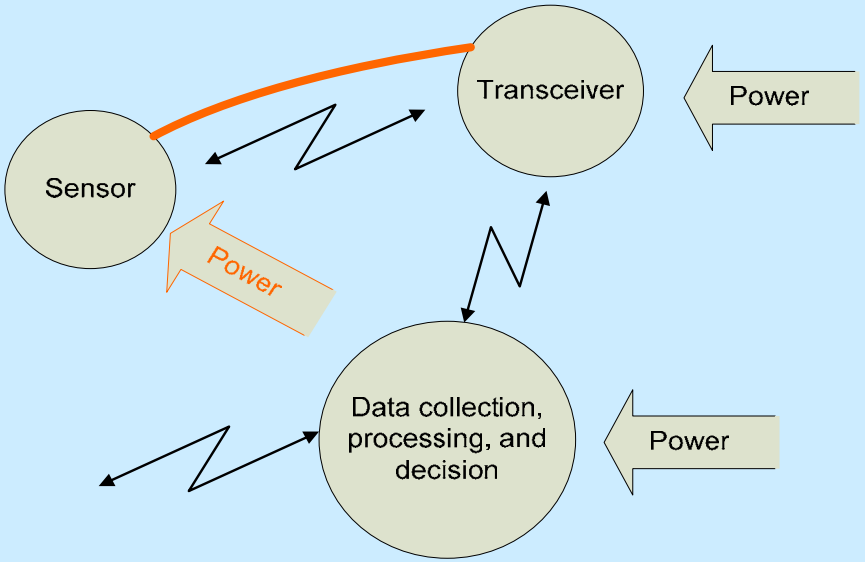
- what has been verified
- what needs to be verified and
- possible risks has been compiled.

This is essential for investors

Competing products

Triage (www.triagewireless.com):

- \+ Same medical objective
- \+ Wireless 'transceiver' - data collection and decision
- – Wired 'transceiver' – sensor (?)
- – Not 'passive' – requires batteries in or wired power to the sensor
- – An optical scheme measuring density (Sense's optical scheme measures displacement + density)
- \+ Signal and data processing most likely with the same key elements



Competing products

- Life Source (A&D Medical)
  - Unlike other monitors that measure blood pressure during deflation of the cuff, the Dual Memory Wrist monitor measures blood pressure during cuff inflation for a faster, more comfortable reading. Each START button stores 30 blood pressure measurements for a total of 60 readings. The average reading feature automatically calculates the “average” of the total readings stored in memory.

Key personnel and competence centers

- People with a solid background in health care business as well as in R&D
- Key medical experts

Kompetence centers:

- ✓ Microtechnology and Surface analysis (DTI)
- ✓ A leading hospital with experts on BP and cardiovascular diseases
- ✓ MIC (DTU)
- ✓ Electronic development
- ✓ Software house

Other applications

Diseases:

- Diabetes
- Blood gas
- Kidney dialysis
- Drug levels
- pH
- Fibrionolysis
- Cholesterol
- Exhaust gas

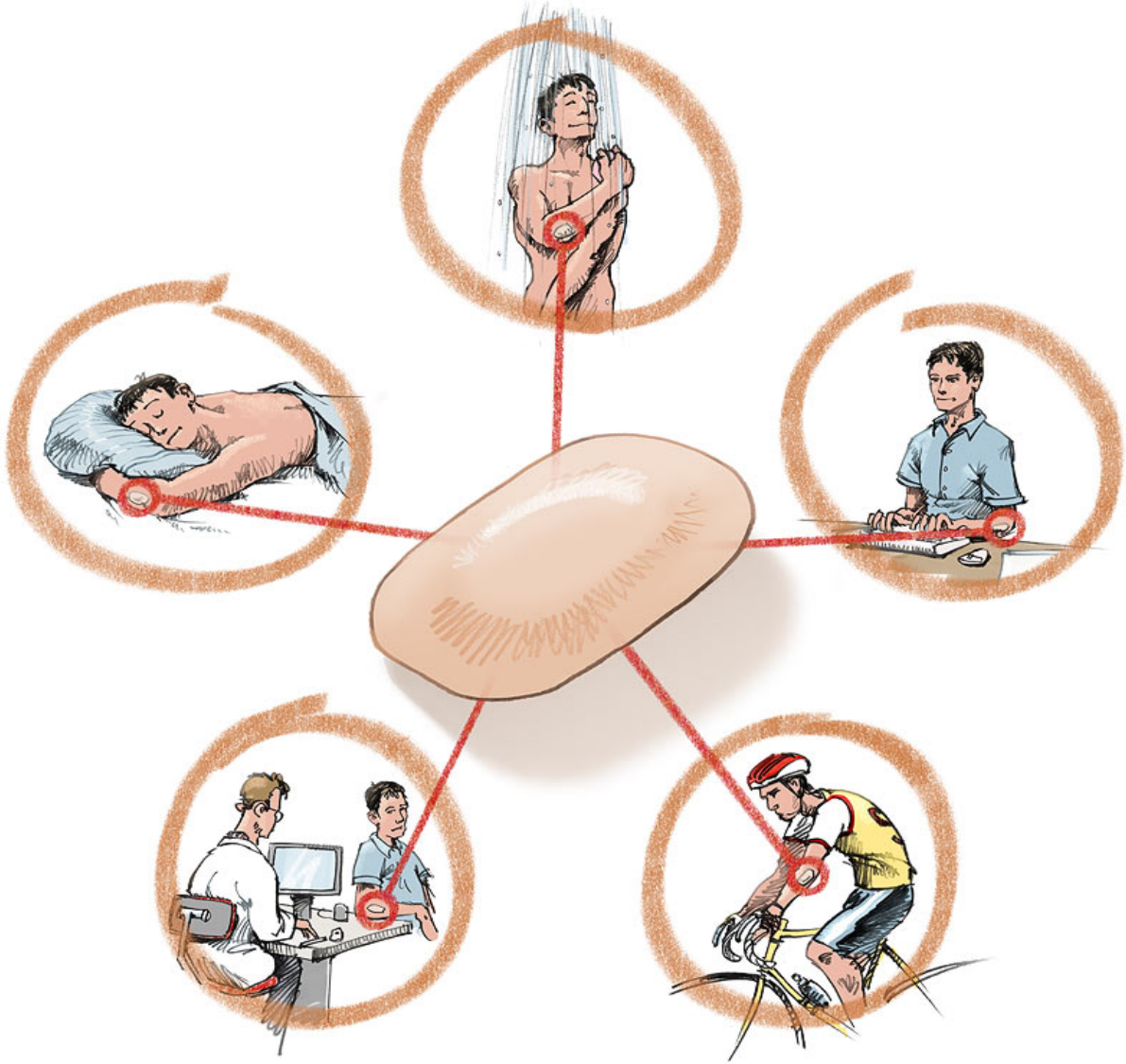
Structural health monitoring:

Embedded sensors (humidity, chlorine conc., strain …)

Example 3: A public-private project on wireless non-interfering sensing

- The wireless technology that can form the basis for a number of wireless medical sensing schemes
- The system architecture
- EMG as a specific example based on research at Univ. of Aalborg/SMI
- Also oxygen in blood, and cardiac . . .

The Electronic Patch: Monitoring with no strings attached!



Electronic Patch

The Electronic Patch Network

From body

- to monitor - *wireless*
- to family or local care – *via LAN or wireless*
- to healthcare centers, hospitals or alarm centrals – *via the internet and EPR*

1 meters **100 meters** **10.000 meters**

Electronic Patch

Benefits!

Shorter length of stay at the hospital

- Fewer days of admission
- Maybe even *no* admission

More freedom

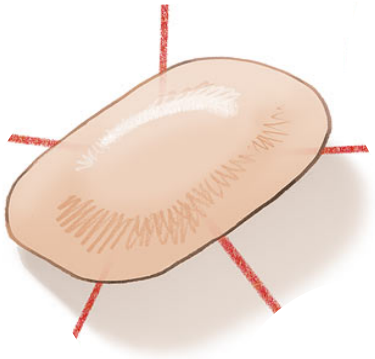
- mobility and sustained ability to work

Better data

- ECG’s without the ”doctor-effect”,
- constant monitoring
- monitoring during normal daily chores

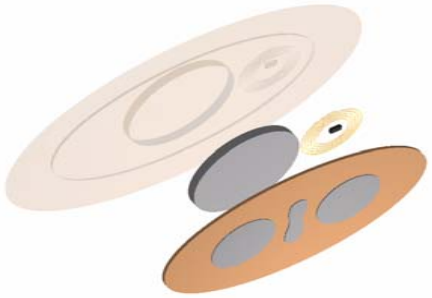
Less perceived sickliness

- An electronic patch will be barely noticeable – by the user or by his/her surroundings
- An aid for prevention and supplementary aid to help t care of our own illness



Electronic Patch

The EP Project

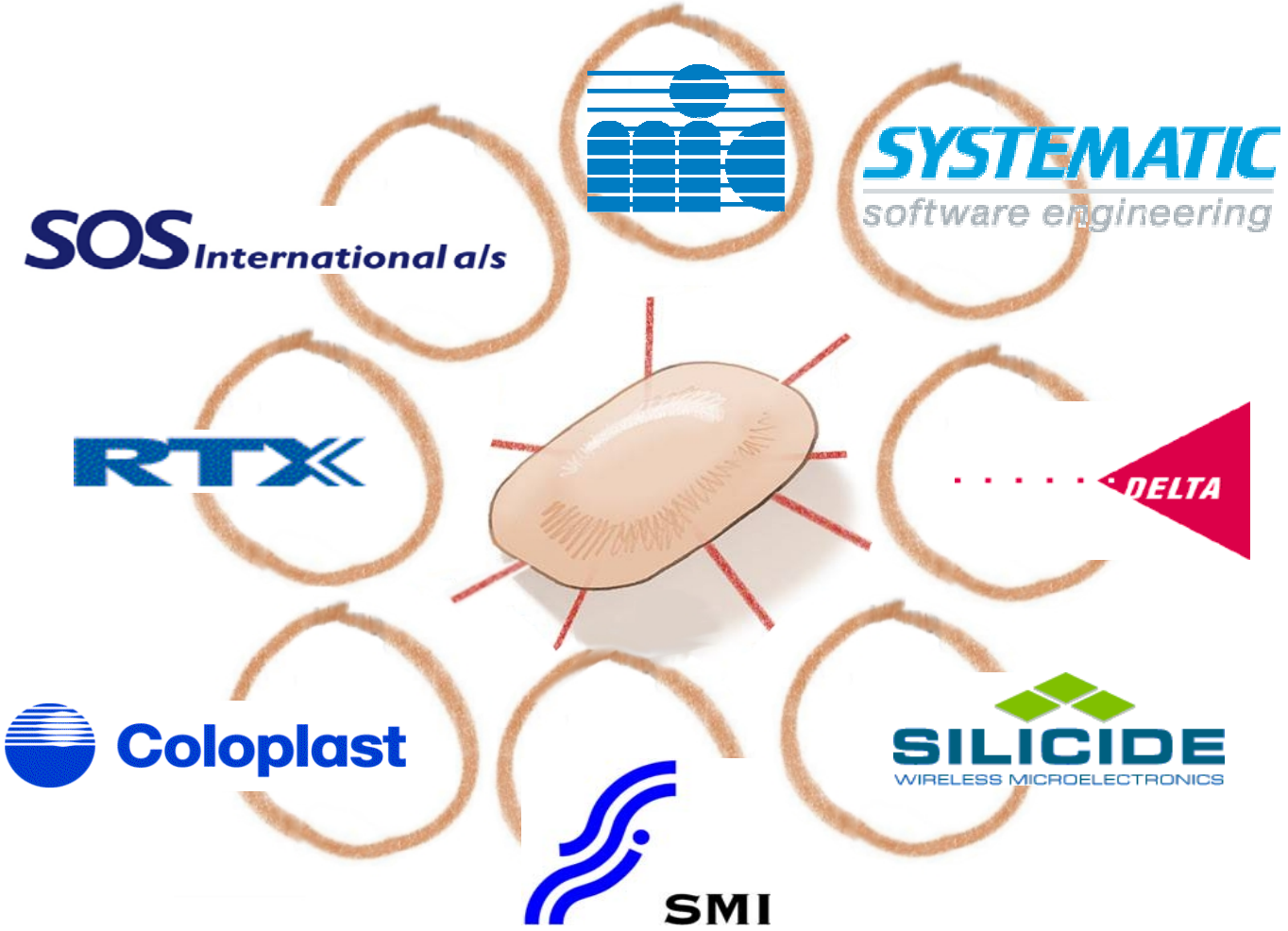


3 yeas and 28 man-years:

- Research and development of wireless sensors embedded in adhesives for physiological measurements
- **New sensors** for measurement of oxygen levels in the blood and heart-function
- Experiments on monitor systems for **measurements on muscles**
- Demonstrations on applications for **heart-patients in their own home and firemen in action**
- Aid other Danish companies with development and deployment of **a technology platform** for the Electronic Patch in new products and services.

Electronic Patch

Partners:



Electronic Patch

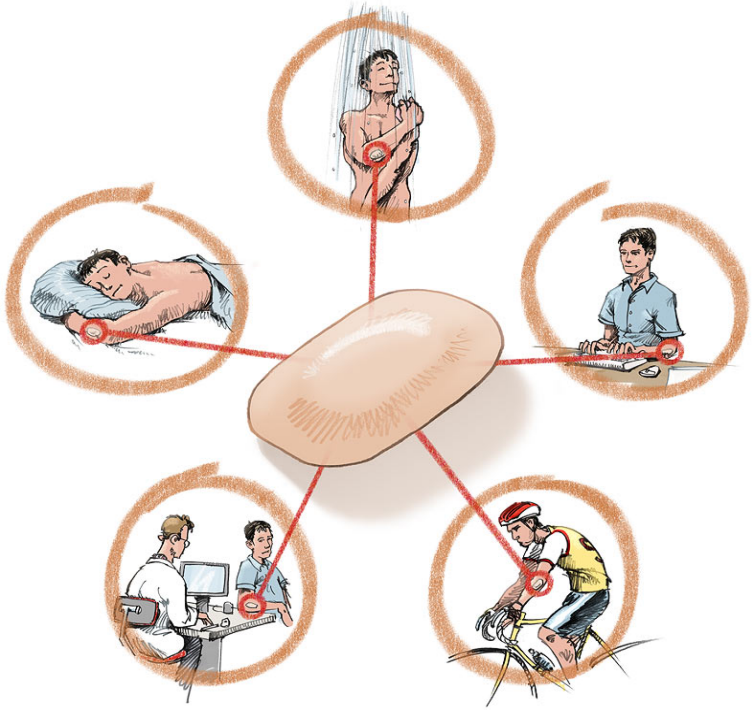
Meeting reality
– the demonstrations and the result

Measurements on patients with heart conditions

- Sygehus Vendsyssel Frederikshavn
- Hjemmeplejen i Frederikshavn.

Firemen

- Århus Brandvæsen
  (Firebrigade of Aarhus)



A Platform for future
products and services!

Electronic Patch

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Observations

FOBIS

- A novel idea is mandatory – but far from adequate
- Small start-ups are generally better at developing and implementing new technology than established companies
- They are not very good at marketing
- Bridging the gab from very early seed capital to venture financing is the most difficult part – and in serious need of new financing schemes
- SBIR in the US could be a model (http://www.sba.gov/SBIR/)
- The Nordic countries do fulfill most – but not all – of the requirements needed to become a world leading player

STC

Nordic shortcommings

- Bridging the gab . . .
- Cross-disciplinary collaboration
- Enough adequately qualified personnel