Oxygen therapy

Mgr. Michaela Miertová, PhD.

Institute of Nursing, JF MED CU in Martin

Basics of Nursing, March 2012

Oxygen and oxygen therapy

oxygen therapy

- is the administration of supplemental oxygen (02) at the concentration greater than in the room air to the patient
- to relieve hypoxemia
- to treat and to prevent hypoxia

oxygen – both a gas and a drug

- non-metallic element occuring freely in the atmosphere
- colourless, odourless, tasteless gas
- essential for human respiration

Purpose of oxygen therapy

- to **increase oxygen saturation** in tissue,
- to **treat hypoxia in hypoxemic** patients,
- to **prevent hypoxia**,
- to **reduce anxiety** associated with lack of oxygen,
- to **reduce fear** from suffocation and death,
- to **achieve effective respiration**,
- to **improve patient´s comfort and health status**,
- to **improve the patient´s quality of life** (e.g. chronic lung disease)

Indication of oxygen therapy

are **therapeutic and preventive** in acute and chronic conditions

- for short-term therapy and long-term therapy
- in home care settings, hospitals
- **treatment**

in short-term therapy, e.g. acute trauma, bleeding, resuscitation, myocardial infarction

in long-term therapy, e.g. in patient with chronic obstructive pulmonary disease throughout the day and night

- **prevention**
- correction of impaired gas exchange and the resultant hypoxemia in various disease states (e.g. pneumonia, chronic bronchitis, left ventricular failure, lung cancer),
- post-anaesthesia recovery

Collaborative level - interdependent

physician

- is responsible for ordering oxygen therapy
- prescribes flow rate in l/min., oxygen concetration (in %), the method of delivery of the oxygen

nurse

- it is dependent nursing intervention – if adminstering oxygen is an emergency measure, can initiate the therapy
- is responsible for assessing respiratory system in patient, response to oxygen therapy, setup of the oxygen therapy, monitoring of the oxygen delivery system, recommending changes in therapy

Oxygen sources

in the home (therapy)
portable oxygen tank
oxygen concentrators

in the hospital
in ambulatory
oxygen cylinder –
„green tank“
oxygen wall outlet system

Oxygen cylinder
tank of oxygen - contents and sizes are various (e.g. D, L, H volume 10 l = 1500 l of O2)
compressed oxygen
oxygen exists as a non liquid gas stored at the precise temperature under high pressure
deliver 95-100 % oxygen

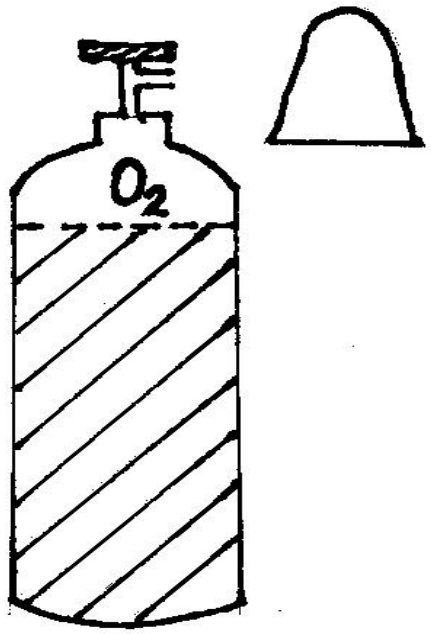
Oxygen cylinder/tank – oxygen is as a gas

Liquid Oxygen Reservoirs – oxygen as a liquid at very cold temperatures

- with two parts – large stationary container, portable small-light weight tank
- it is used in patient with chronic respiratory insufifciency

Cylinder

- is generally encased in a metal carrier equipped with wheels for transport
- cap on the top protects the valves and outlets



Example of holders

- tank is encased in metal carrier equipped with wheels for transport

in home care – in long-term therapy

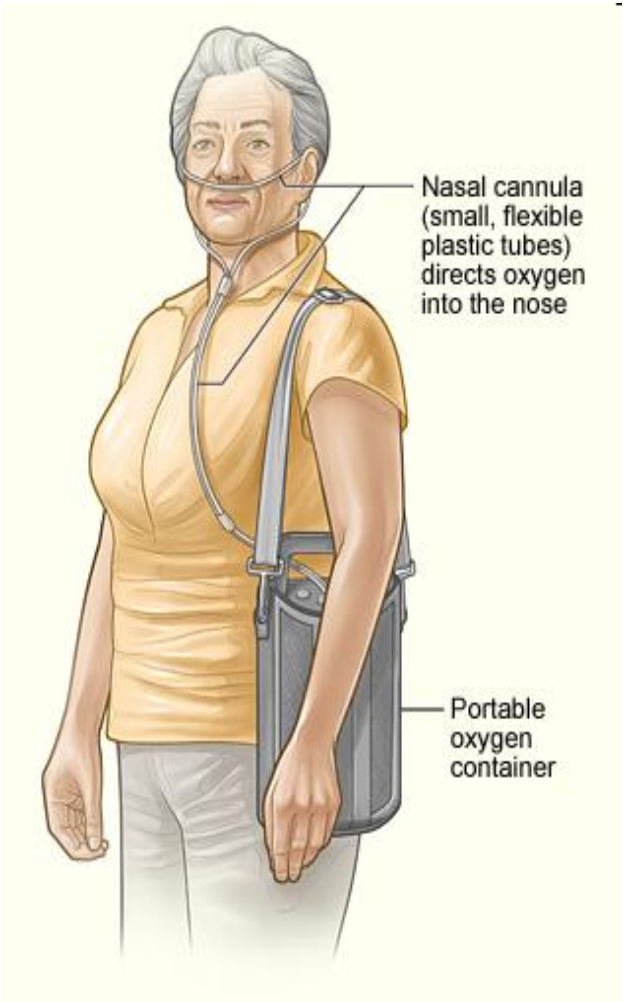
Oxygen concentrators
sometimes referred to as compressor or condenser is a sophisticated medical oxygen producing machine,
consisting of a series of filters that turns ordinary breathing air (21 % oxygen) into medical oxygen of 90 % oxygen and greater.

the most economical
the most suitable
the most widespread
the portable/floor-standing

↑

patient and relatives need
informations – education

Portable oxygen container – nasal cannula



Portable oxygen container – oxygen mask

Oxygen flow meter

- device that regulates the

flow rate in l/min

- it is attached to the outlet system
- to assess the oxygen level

Oxygen regulator

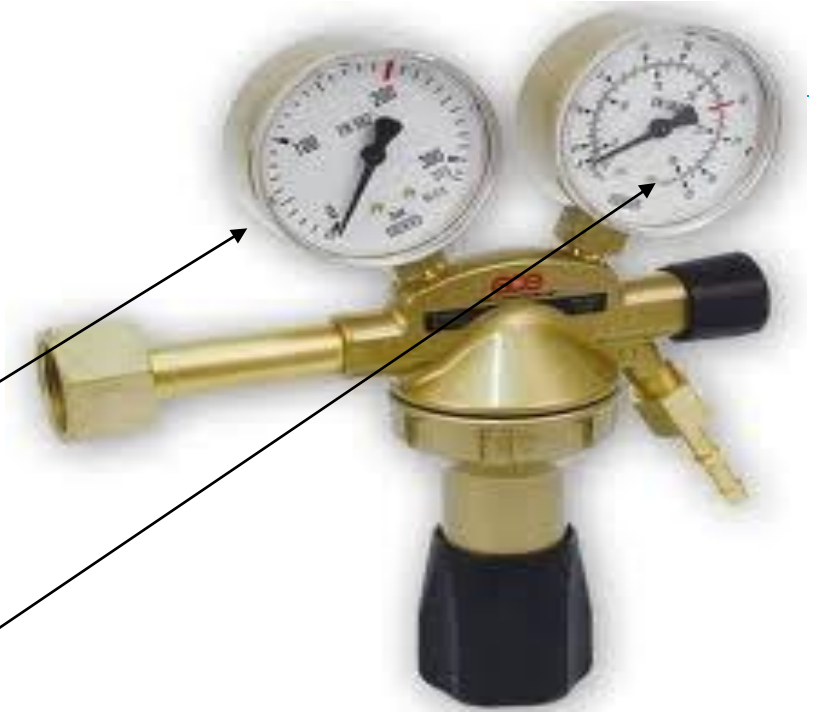
- attach to oxygen cylinder
- it has 2 gauges:

Oxygen regulator

attach to oxygen cylinder

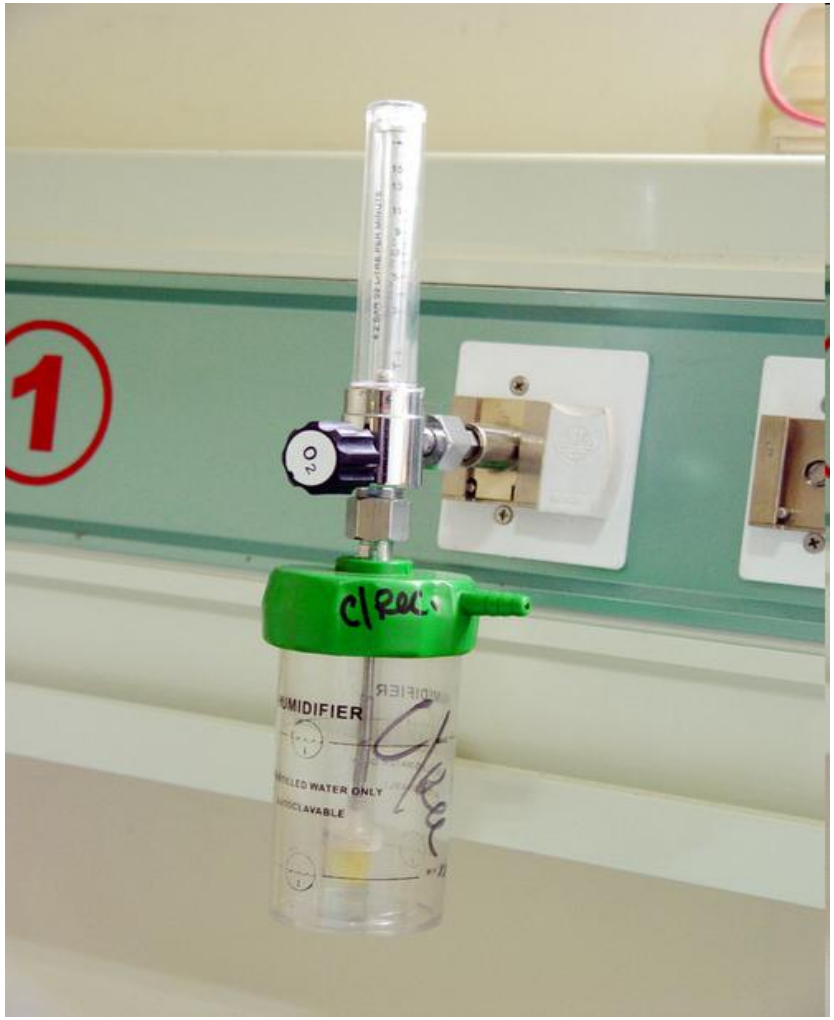
it has 2 gauges:

1. Cylinder content gauge
   nearest the tanktah
   indicates the pressure or
   amount of oxygen in tank
2. Flow meter gauge
   indicates gas flow in litres
   pre monute (l/min.)



Humidifier (humidified oxygen source)

- it is used during the administration of oxygen
- bottle filled with distilled water
- it is device that produces small water droplets



Outlet system in the wall in hospital


Pure

Oxygen is administered by

low-flow system

– administraiton devices include nasal cannula, simple face mask, partial re-breathing mask, non re-breathing mask

high-flow system

– face tent, oxygen hood, incubator

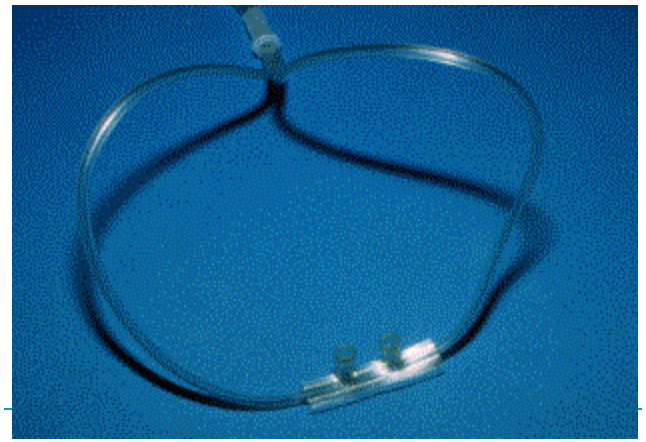
The fraction of inspired oxygen is variable depending on the patient´s respiratory rate and volume and the oxygen liter flow

Common oxygen delivery system

nasal cannula (spectacles)

- simple, very common, comfortable device
- effective mechanism for delivering oxygen to a patient
- patient can breathe trough mouth /nose
- available for all age-groups
- easily accepted by most patients
- it is a thin, plastic, disposable hollow tube

- tube with the two prongs, about 1.5cm long; protruding from the centre of this tube



insert the two prongs of the cannula into the nares

Spectacles is held in place by wrapping the tubing around the ears

delivers oxygen in a concetration of 20–40 %, 1-6 l/min.


12/16/2006

Nasal cannula in oxygen therapy (low flow device)

http://www.youtube.com/watch?v=MNzCfO7Z0Fk&feature=related

What not to do nasal cannula

http://www.youtube.com/watch?v=Bcogbl8TuoI&feature related

Complications – administering O2 by spectacles

- can irritate the skin on the cheeks and behind the ears
- higher concentrations dry nasal and oral mucous membranes
- rarely complication are perforation of nasal septum (long-term use)

Face mask

- is made of clear pliable plastic or rubber
- is various sizes (for adult, childrer
- with elastic strap (to secure the mask in place) – adjust around head
- is shaped to fit snugly over the patient´s mouth and nose

http://www.youtube.com/watch?v=VgIiZ84ujlY&feature=related

simple face mask

- fits over the nose and mouth
- allows atmospheric air to enter and exit through side ports
- delivers oxygen in concetration of 35-40 %
- flow rate about 6 l/min.

Venturi mask (ventri mask, air entrainment mask)

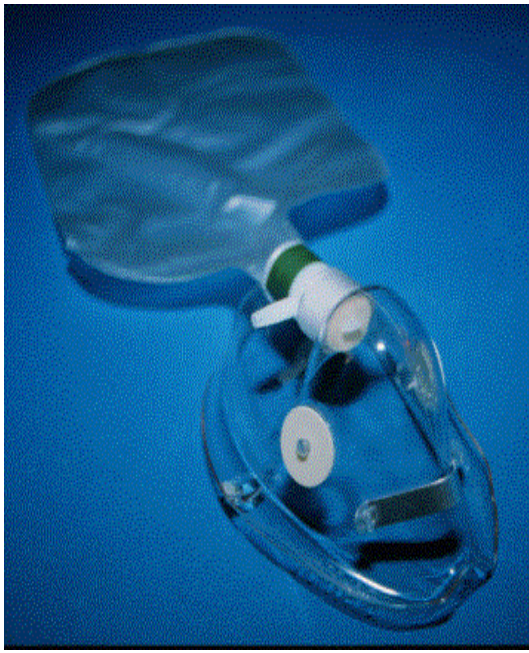
- is a cone-shaped device
- with entrainment ports
- various sizes
- it mixes a precise amount of oxygen and atmospheric air
- humidification can be added
- delivers oxygen in a concetration of 24 - 50 %,
- flow rate 4-8 l/min.

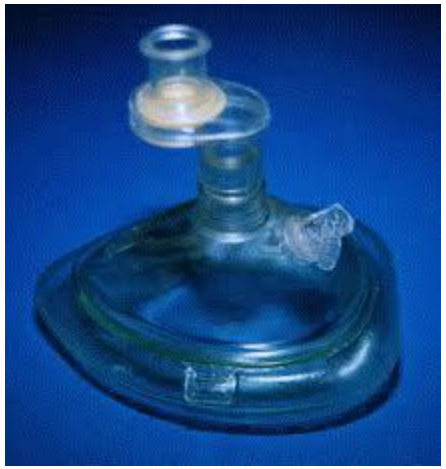
partial re-breather mask

- is a simple mask
- with reservoir bag (fills with oxygen)
- delivers oxygen in a concetration of (50) 60 – 90 %
- flow rate 6-10 (15) l/min
- for adult and and child

Non-re-breather mask

- similar to the partial re-breathing mask
- has a series of one-way valves
- delivers oxygen in a concetration of 95-100 %





This mask consists of a mask that has a reservoir bag attached. The bag is separated from the mask by a one-way valve that prevents air and patient exhalation from diluting the oxygen in the reservoir bag. When the patient inhales, the valve opens and the patient breathes primarily oxygen. There are also one-way valves that cover the holes on the mask to allow patient exhalation to escape without allowing large quantities of air to enter the mask.

Some masks have this one-way valve on both sides of the mask.

Administering oxygen via non-rebreather mask and nasal cannula

http://www.youtube.com/watch?v=fyg5FnGk0zA

Suplemental oxygen administration

http://www.youtube.com/watch?v=z46Fjmj2sCM&NR=1

Complications

- long term use : may irritate skin
  cause pressure sore
- anxiety among claustrophobic patients

Infant oxygen delivery system

OPOD (overnight pediatric oxygen delivery) system – fully non-contacting method of delivery oxygen to children, it includes:
- hood structure to help contain the supplemental oxygen
- positional sensor system
- oxygen delivery system

Infant oxygen chair/oxychair

Infant oxygen hood

Infant Incubator

Examination of oxygen saturation– **pulse oxymetry**

- quick, photo-diagnostic non-invasive method that estimates the arterial blood oxygen saturation
- it is used in patients in the perioperative period, postoperative care

- pulse oxymeter – device with sensor attached to the final segment/phalanx patient´s finger (common place of measurement)

less common places of measurement: apex nasi,

Pulse oxymeter – fingertip type

Fingertip type

Pulse oxymeter – handheld type

- to detect hypoxemia before clinical signs and symptoms have manifested, e.g. dusky skin color
- result of measurement is present as **SpO2 or SaO2**

value of tissue oxygenation in %

normal range	90-100 %
may be acceptable in chronic disease conditions	85-89 %
abnormal	less than 80 %
life threatening	below 70 %

http://www.youtube.com/watch?v=Dy-F_Gaw9mg

http://www.youtube.com/watch?v=cYwP3ibxtMg&NR=1

Sampling for arterial blood gas analysis

- invasive diagnostic procedure
- is performed to evaluate the patient´s acid-base balance, oxygenation, adequacy of ventilation, hypoxic states
- **who?**

abroad : specialty nurse, medical (laboratory) technician, psyhician can take arterial blood

in our country – nurse assists the physician during the procedure, physician is responsible for sampling

- puncture site: radial, brachial, femoral arteries

Equipment

- 2 ml pre-heparinised sterile syringe (with cap)
- sterile needle
- sterile gauze or cotton swabs
- disposable gloves
- skin antiseptic
- adhesive tape
- hub or rubber stopper for needle
- ice-filled plastic bag (*when analysis is delayded)*

Arterial blood gas sampling

Radial Artery Puncture

http://www.youtube.com/watch?v=stxntv0KkBE

Femoral Artery Puncture

http://www.youtube.com/watch?v=Q1MTjMtsvag

Sampling for capilary blood gas analysis

- invasive diagnostic procedure
- it is a useful alternative to arterial sampling
- who?
- in our country – nurse is responsible for sampling
- abroad: specialty nurse, medical (laboratory) technicians

- puncture site : fingers – final segment/phalanx
  concha of auricle
  lateral areas of heels, toes (in children)

http://www.youtube.com/watch?v=Wg-U7GlSGAk

Equipment

- 2 micro capillaries/pre-heparinised glass capillar tubes
- 4 plastic cap
- 2 steel staples/metalic staples
- magnet
- sterile needle/ sterile lancet
- skin antiseptic
- disposable gloves
- sterile cotton/gauze swab
- adhesive tape
- tube test (glass)
- ice-filled plastic bag
- kidney dish

Thank you for your attention...

miertova@jfmed.uniba.sk

References

- AARC Clinical Practice Guideline. Oxygen Therapy for Adults in the Acute Care Facility. 2002. In *Respiratory Care*. ISSN 0020-1324, 2002, vol. 47, no. 6, pp. 717-720.
- BERMAN, A. - SNYDER, S. J. - KOZIER, B. - ERB, G. 2008. *Kozier and Erb´s Fundamentals of Nursing. Concepts, Process and Practice*. 8th ed. New Jersey : Pearson Prentice Hall, 2008. 1631 pp. ISBN 0-13-608004-9.
- BOWDEN, V. R. - GREENBERG, C.S. 2008. *Paediatric Nursing Procedures*. 2nd ed. Philadelphia : Lippincott Williams and Wilkins, 2008. 823pp. ISBN 0-7817-6682-6, ISBN 978-7817-6682-1.
- CRAVEN, R. F.- HIRNLE, C. J. 1992. *Fundamentals of Nursing. Human Health and Function.* Philadelphia : J. B. Lippincott Company, 1992. 1522 pp. ISBN 0-397-54669-6.
- FÚROVÁ, A. - OSACKÁ, P. 2007. Odber a odosielanie biologického materiálu na vyšetrenie. In Osacká, P. a kol. *Techniky a postupy v ošetrovateľstve*. [CD-ROM]. 1.vyd. Martin : Ústav ošetrovateľstva, JLF UK, 2007. 505s. ISBN 978-80-88866-48-0.
- GOMOLČÁKOVÁ, V. a kol. 2004-2006. *Rámcové procesuálne štandardy ošetrovateľských výkonov I.-VII.* Mimoriadna príloha Zdravotníckych novín a časopisu Sestra, 1.vyd. Bratislava : MZ SR, 2004-2006.
- HERDMAN, T. H. 2009. *NANDA International Nursing Diagnosis: Definitions and Classification 2009 – 2011*. Singapore : Wiley – Blackwell, 2009. 435 pp. ISBN 978-4051-8718-3.
- KONTROVÁ, Ľ. a kol. 2005. *Štandardy v ošetrovateľstve*. Martin : Osveta, 2005. 215 s. ISBN 80-8063-198-0.
- KOWALAK, J. P. 2008. *Lippincott´s Nursing Procedures*. 5th ed. Philadelphia : Lippincott Williams and Wilkins, 2008. 949 pp. ISBN 13: 978-0-7817-8689-8, ISBN 10: 0-7817-8689-4.

- KOZIER, B. - ERB, G. - BERMAN, A. - SNYDER, S. 2003. *Kozier and Erb´s techniques in clinical nursing. Basic to intermediate skills.* 5th ed. Upper Saddle River, N. J. : Prentice Hall, 2003. 752 pp. ISBN 13: 978-0-13-114229-9.
- KOZIER, B. - ERB, G. - BERMAN, A. - SNYDER, S. 2004. *Fundamental of Nursing. Concepts, process, and practice.* 7th ed. New Jersey : Person education, 2004. 1518 pp. ISBN 13: 978-0-13-045529-6.
- KUHN TIMBI, B. 2009. *Fundamentals Nursing Skills and Concept.* 9th ed. Philadelphia : Lippincott Williams and Wilkins, 2009, 969pp. ISBN 978-0-7817-7909-8.
- MASKÁLOVÁ, E. 2008. Dýchanie. In Tomagová, M., Bóriková, I. *Potreby v ošetrovateľstve*. Martin : Osveta, 2008. s. 41-47. ISBN 80-8063-270-0.
- McDONALD, CH. F. - CROCKETT, A. J. - YOUNG, I. H. 2005. Adult domiciliary oxygen therapy. Position statement of the Thoracic Society of Australia and New Zealand. In *MJA.* ONLINE ISSN 1326-5377, 2005, vol. 182, no.12, pp.621-626.
- *Mosby´s dictionary of medicine, nursing and health professions.* 2009, 8th ed. St. Louis: Mosby Elsevier, 2009. 2240 pp. ISBN 978-0-323-04937-5.
- *Oxygen therapy.* [online]. [cit.2010-08-27]. Available on: http://www.enotes.com/nursing-encyclopedia/oxygen-therapy
- *Oxygen therapy procedure. Critical Care Therapy and Respiratory Care Section.* 2002. [online]. 7 pp. [cit.2010-09-09]. Available on: http://www.cc.nih.govccmd/cctrcs/pdfdocs/Medicinal%20Gas%20Therapy/01-Oxygen%20 Therapy.pdf

- PERRY, A. G. - POTTER, P.A. 2004. *Clinical Nursing Skills and Techniques*. 6th ed. St. Louis : Mosby Inc., 2006. 1611 pp. ISBN-13: 978-0-323-02839-4.
- OSACKÁ, P. 2007. Oxygenoterapia. In Osacká, P. a kol. *Techniky a postupy v ošetrovateľstve*. [CD-ROM]. 1.vyd. Martin : Ústav ošetrovateľstva, JLF UK, 2007. 505s. ISBN 978-80-88866-48-0.