



Improvement of Reading Room Environment
in Teleradiology Services:
Prevention of Physical and Mental Disability
by Interpretation

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Recently, many radiologists have developed health disorders (e.g. musculoskeletal disorder, visual system dysfunction, mental disability) through the increase in interpretation duties on the PACS workstation.

Environmental improvement of the reading room is important to prevent health hazards in radiologists. In this presentation we give a concrete example of a real reading room in teleradiology services and explain some methods for comfortable interpretation.

PURPOSE/AIM

- To prevent physical and mental disability of radiologists by interpretation work**
- To improve interpretation efficiency**
- To improve QOL of radiologists**

Working Safely with Video Display Terminals

U.S. Department of Labor

Occupational Safety and Health Administration

OSHA 3092 1997 (Revised)

Health Effects

Visual Problems

Fatigue and Musculoskeletal Problems

Radiation

Interventions

Lighting

Work Station Design

VDT Design

Work Practices Job Organization

Physical and mental disability by interpretation work

Visual system dysfunction

- Computer vision syndrome**

Musculoskeletal disorder

- Repetitive strain injuries**

Mental disability

- Technostress**
- Depression**

Others

- Organic dysfunction**
- Metabolic syndrome**

Computer vision syndrome

Eyestrain

**sore, aching, irritated, blurred,
double vision**

Dry eye syndrome

Headache



Etiology

Visual capability

un-corrected, unsuitably corrected

Video display

character, contrast, color

Work place lighting

brightness, glare

air-conditioning

low humidity

Heavy workload

Measure

Vision correction

viewing distance VDT > hard copy

Display

size, suitable character, color, black/white

Workplace lighting

Window screen, partition

Task-ambient illumination

Indirect up-lighting system

Controllable illumination

Hand lighting

Air-conditioning

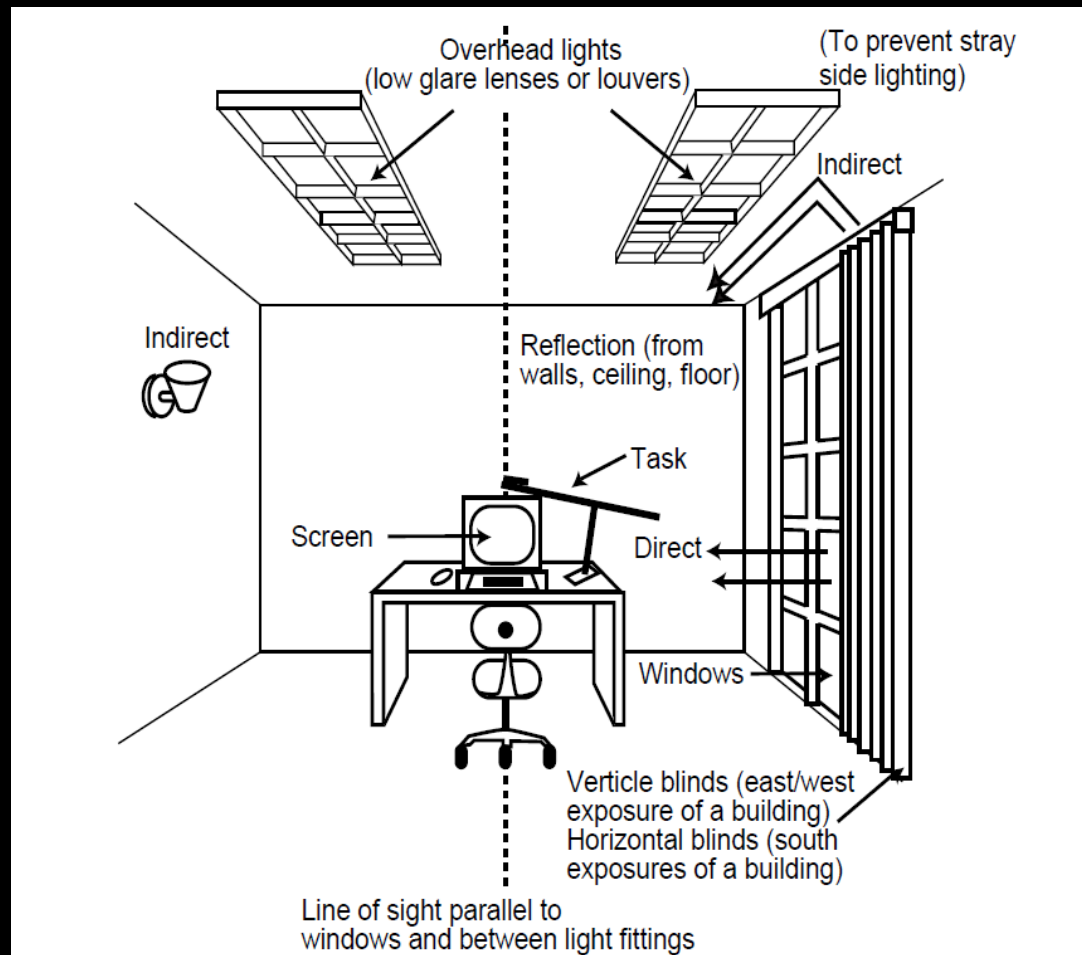
humidifier, fresh air intake

Work control

length, pace, break

Position of light source relative to the VDT.

OSHA 3092 1997



Task-ambient illumination

Window screen

Partition

Indirect up-lighting system

Controllable illumination

Hand lighting

Musculoskeletal disorder

Repetitive strain injuries

**back, neck, shoulder discomfort
painful/stiff neck or shoulder**



Etiology

Seated

fixed, awkward, inadequate posture and arm position

→ **biomechanical stress**

Repetition

high rate of key stroke

Heavy workload

Measure

Seat-desk

chair: backrest, arm rests, chair base
footrest ergonomic chair

Keyboard

height, configuration ,
transcriber, speech recognition

Display

size, height, adjustability
flexible monitor stand

Break

sofa (recliner, massage), refreshment

Exercise

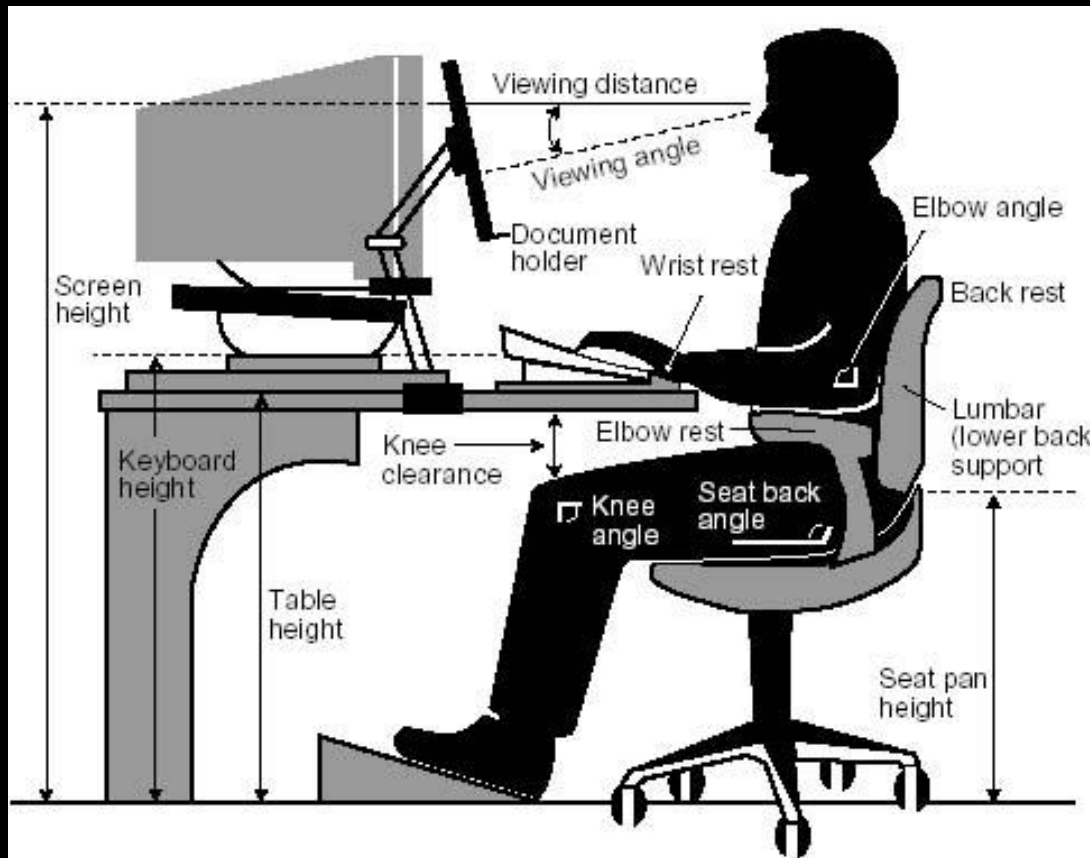
usable, effective, safe

Work control

length, pace

Proper user position and support.

OSHA 3092 1997



Chair, Desk, Workstation

Chair height:

0.23 of body height or the “popliteal” height

Stable chair: 5 star bases

The entire sole of the foot can rest on the floor or footrest

Lumber support

Viewing angle $-10^{\circ} \sim -30^{\circ}$

Viewing distance $>40\text{cm}$

Elbow angle 90°

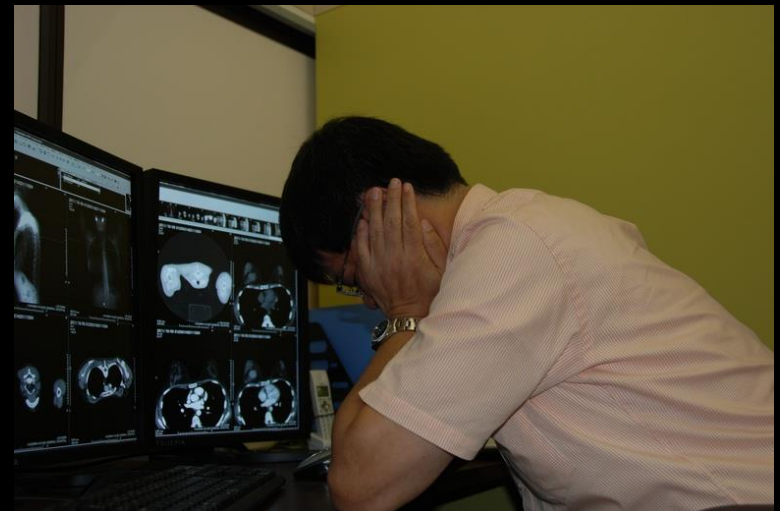
Mental disability

Technostress

Depression

Burnout and dissatisfaction

Malpractice stress syndrome



Etiology

Heavy work load (increasing in Japan recently)

Narrow space of work place

Stress for malpractice

Measure

Control work load

Partition, space of reading desk

Coloring of reading room

Reading assistant

Break , refreshment



IRIMOTOMEDICAL INC.

Teleradiology service managed by independent radiologists established in 2001

Tokyo Main Office , Two branch offices

Original Internet VPN

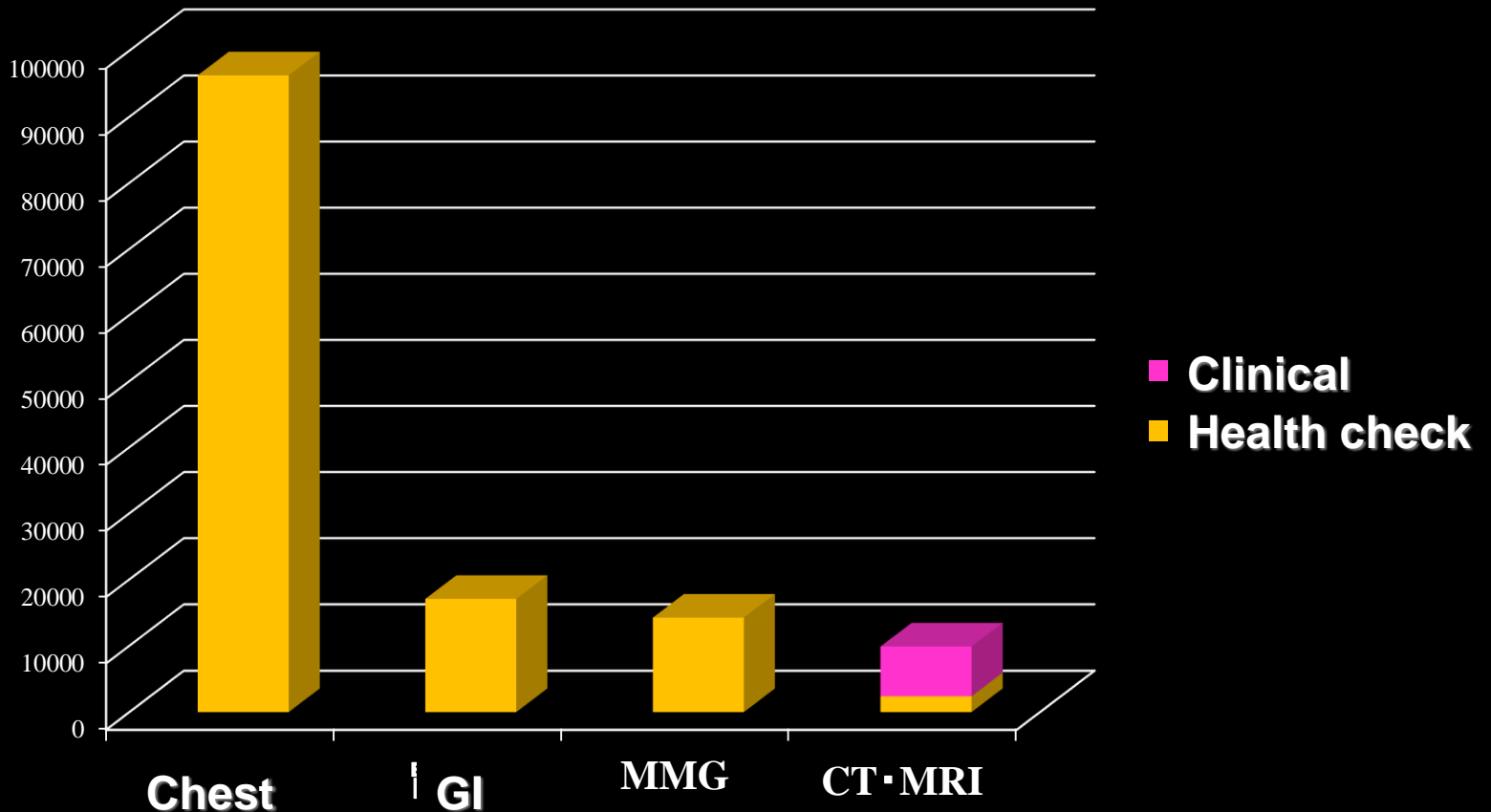
Full time radiologist 2 Part time radiologist 8

Assistant 3 System engineer 1

Accounting manager 1

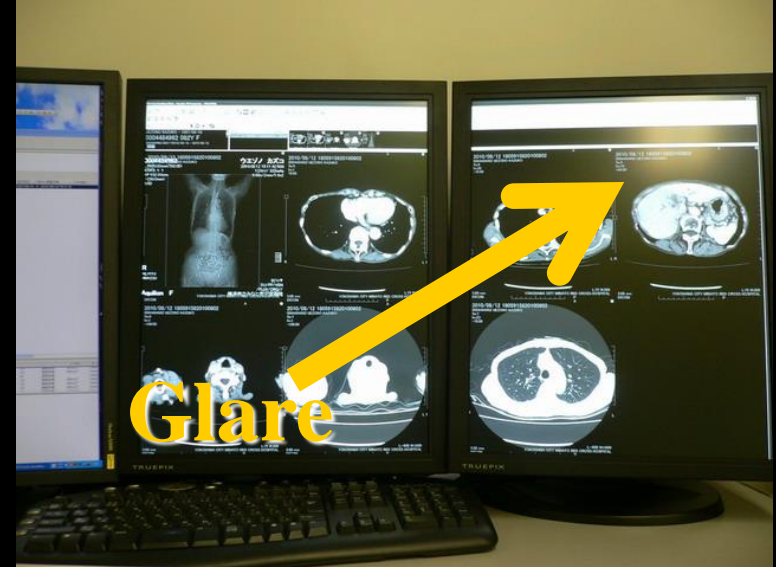
Equity capital No debt

Reading cases (2010)



Health check up 129939 clinical 7500 total 137439

Reading room of Tokyo office (~2009.12)



Vertical blind: sunlight enters
Ceiling exposed illumination: glare
Increase of the number of radiologists
: interfere mutually

Required improvement of reading environment

Reforming of Reading Room



2009.12~

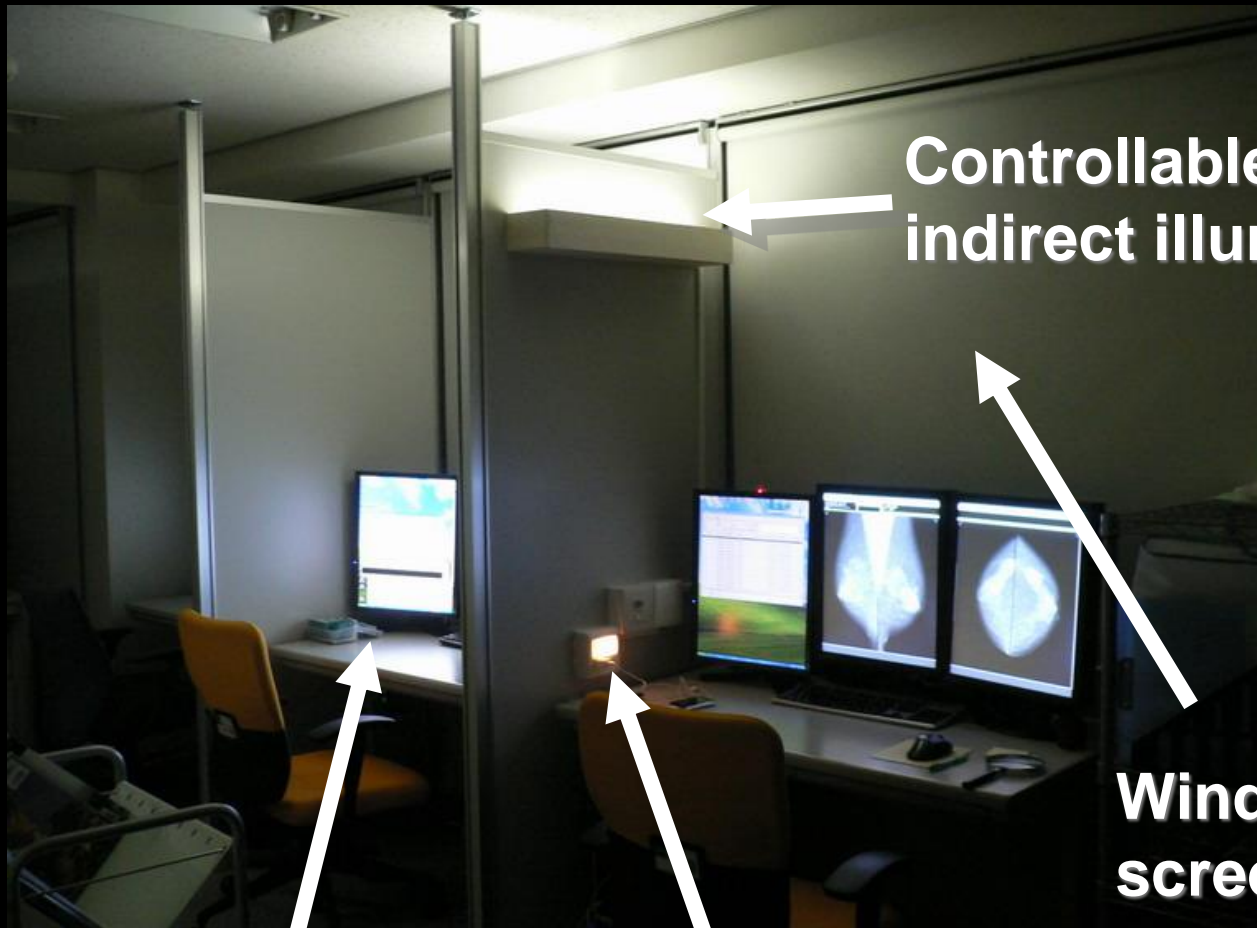
Window blind screen
Task-ambient lighting
Partition



2011.05~

Wider space
Color coordination
Ergonomic chair
Original reading desk
Fresh air intake

Task-ambient lighting



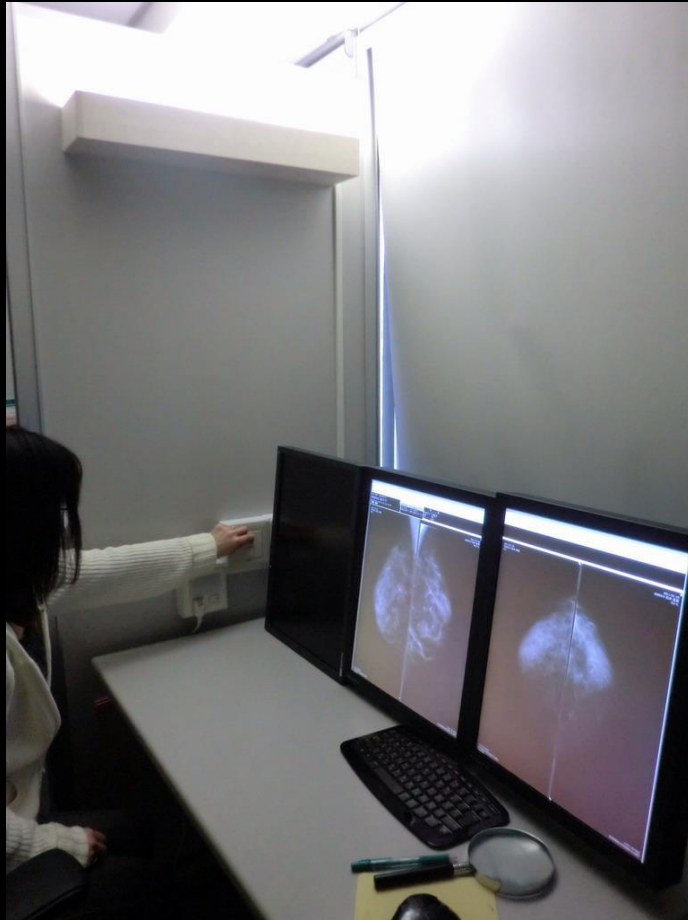
Controllable LED indirect illumination

Window screen

Hand lighting

Partition separated reading booth

Suitable lighting control united with the image



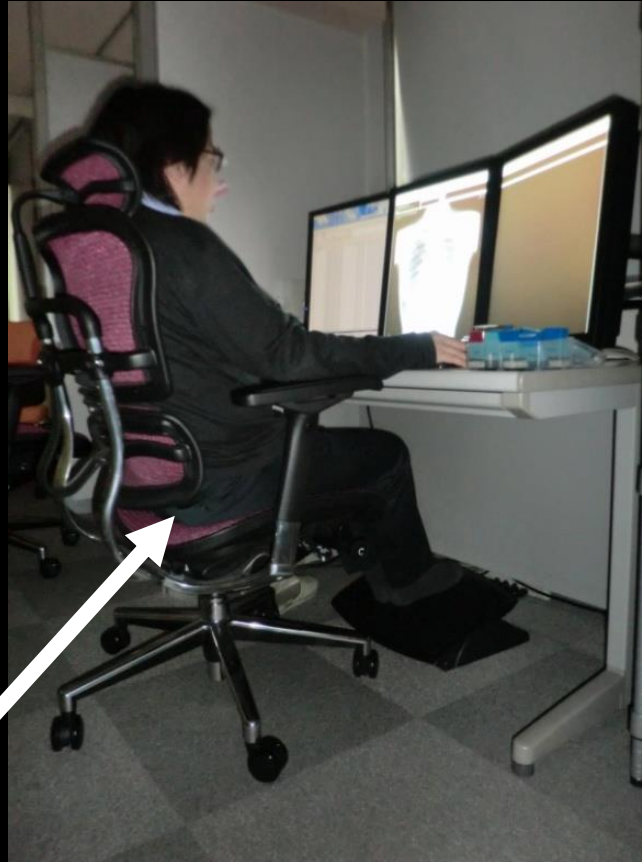
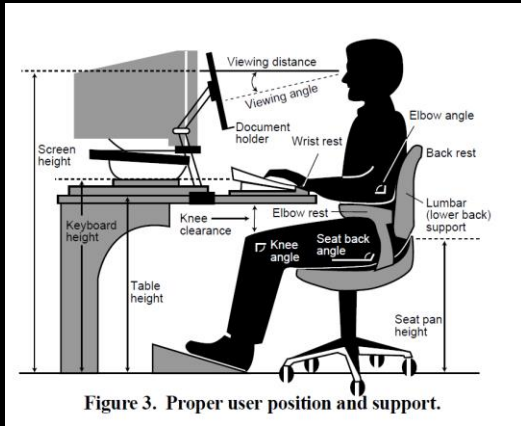
**Controllable LED indirect illumination
Hand controller**

Hand lighting



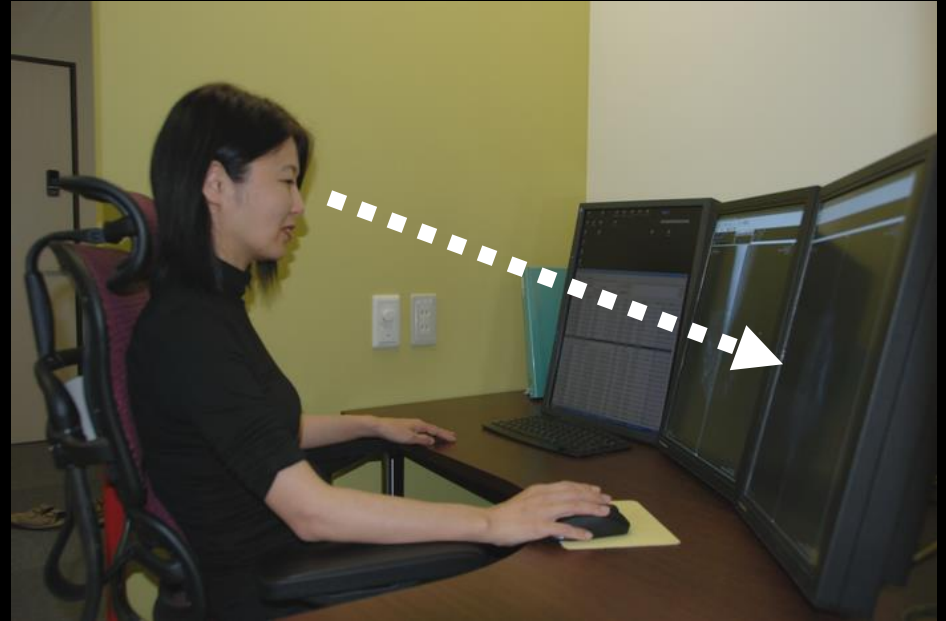
Power receptacle

Ergonomic Chair Footrest



Adjust for individual radiologist
Armrest should be on the same level as the desktop

Flexible monitor stand



Monitor height and angle are adjusted freely.

Look downward monitor position

Keyboardless report writing with multifunctional mouse and speech recognition

left:backspace right:space
push:enter rolling:paging

start reporting

previous pt.

next pt.



Key of a keyboard is assigned to a multifunctional mouse.

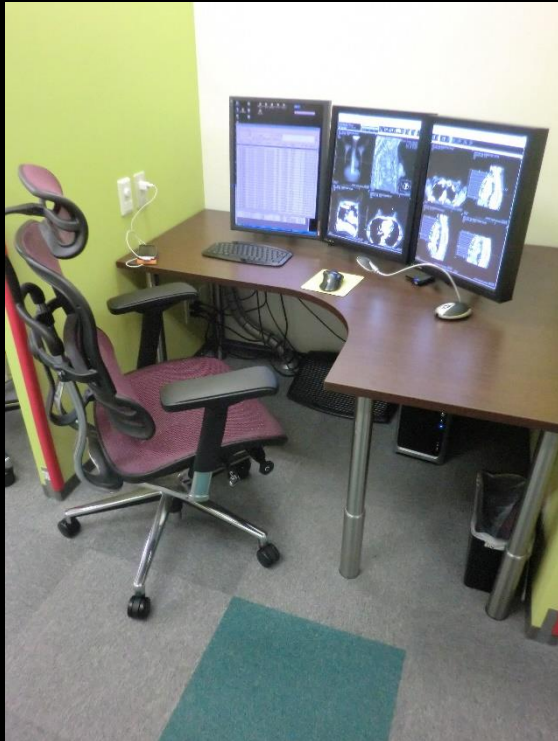
Selection and customization of a workstation



Workstations are indispensable medical-examination tools for radiologists. Radiologists should carefully select according to their personal preference. It should be customized if required.

Color coordinated reading booth

The reading booth is arranged so that privacy may be kept suitable and communication may be possible.

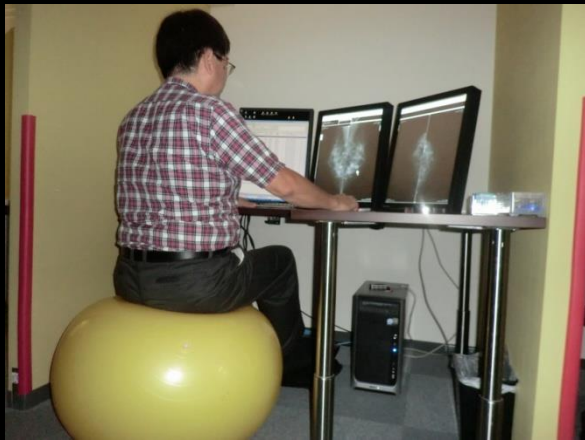


Exercise and relaxation

Balance ball

Chair yoga

Rest space



Reading assistant

Leaving miscellaneous business to assistants, the radiologist must concentrate on reading.

The refreshment and sweets delivered at appropriate timing relieved tiredness of reading.

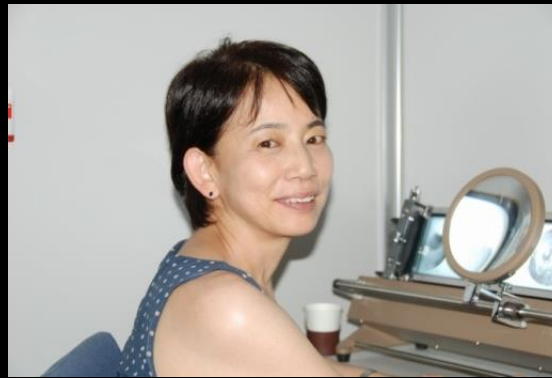
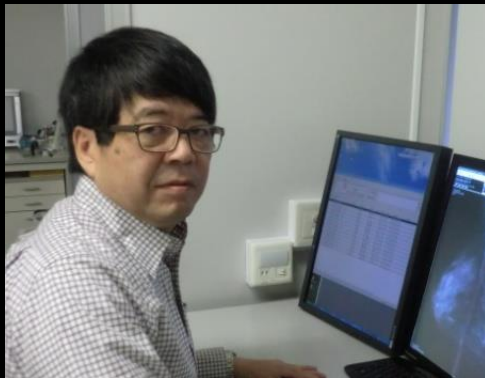


Conclusion:

In order to improve the ideal environment, capital investment and personnel expenses are required.

In a teleradiology service center while there is a heavy and varied work load, capital investment for environmental management is easy.

It is necessary to consider a good balance of both.



References:

Occupational Health Aspects of Work with Video Display Terminals

Soo-Yee Lim et al, Chapter 100, Environment and Occupational Medicine Third Edition Lippincott-Raven Publishers Ph., 1998

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