Third Saudi Forum
For Planning and Design of Hospitals
“Healing Environments at Hospitals”

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Under the patronage of Minister of Health

Innovation Thinking in Healthcare Design

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Architect
MIND & IBI Group
Saudi Arabia, UK
Innovative Thinking in Healthcare Design

Richard Mazuch
IBI Group
**MIND and IBI** are creating a unique collaboration in Saudi Arabia to deliver professional consultancy services in Healthcare design.

We share a belief in changing the architecture of health care and creating truly sustainable buildings. We bring an expert knowledge of International clinical practice and its architectural needs coupled with local knowledge, sensitivity and a proven track record in designing and delivering highly complex projects.
Initially inspired by the desire to create patient-centred environments, IBI THiNK now focuses on all sectors, including places for working and learning.

The work of IBI THiNK highlights the important link between research and practice. Its activities encompass:

• In-house research to support design projects
• Commissioned research
• Technical research with industry partners
• Guidance, compliance and advice documentation
• Product and furniture design
• Clinical planning innovation
Sense Sensitive Design

Sight
- Light
- Colour
- Vista

Hearing
- Sounds
- Noise

Touch
- Texture
- Temperature

Smell
- Odour
- Aroma

Taste
- Sweet
- Sour
- Bitter
- Salty

Innovative Thinking in Healthcare Design / Richard Mazuch
21 Senses

Blood Pressure
Cerebrospinal fluid pH
Plasma osmotic pressure
Lung inflation
Temperature
Heat
Touch
Cold
Salt
Sour
Bitter
Sweet
Taste
Balance
Colour
Hearing
Proprioception – Joint Position
Artery-vein blood glucose difference
Mechanoreception
Light
Kinaesthesia
Sight
Blood Oxygen Content
Umami
Smell
Pain
Physiological
Autonomic System
Breathing, circulation, digestion

Motor System
Muscle tone, posture, movement patterns

State System
Sleep, awake, weak, restless, anxious
Labour / Delivery Room
“The fact that subjects instructed to use their own imagery with music reported less subjective pain is reported as being more attractive to nursing intervention.

Mental Health Bedroom
“Natural sunlight can be an underestimated light therapy for Bipolar Depression”

Bronchoscopy Unit
“distraction therapy with nature sights…significantly reduces pain in patients undergoing flexible bronchoscopy”

Blood Donor Clinic
“Pulse rates were markedly lower during Nature than Urban (picture settings)”

NICU
“Decreasing the amount of sunlight entering the ward significantly increased the rate of neonatal jaundice from 0.5% … to 17%”.

ITU/Critical Care Unit
“Stressors in a SICU have a greater impact on subjects who develop delirium or impaired psychological response”

ITU/Critical Care Unit
“Sensory deprivation stemming from lack of windows on intensive-care units is associated with high levels of anxiety and depression – and with high rates of delirium and temporary psychosis”
Verderber, S. Dimensions of Person-window transactions in the hospital environment, Environment and Behaviour, Vol 18, No. 4, July 1986 450-466

Coronary Care Unit
“Patients stayed a shorter time in sunny rooms”
Inpatient Bedroom
“patients with the tree view had shorter postoperative hospital stays”

Surgical Ward
“The use of ocean sounds is a viable intervention to foster optimal sleep patterns”
Williamson J. W The effects of Ocean Sounds on Sleep After Coronary Artery Bypass Graft Surgery, American Journal of Critical Care, Vol. 1, No.1, 91-97, 1992

NICU
“Therapeutic use of music with high-risk neonates appears to be promising”
Caine, J. The effects of music on the selected stress behaviours, weight caloric and formula intake and length of hospital stay of premature and low birth weight neonates in a newborn intensive care unit, J of Music Therapy Vol. 27, No.4 Winter.

Birthing Pool
“The fact that subjects instructed to use their own imagery with music reported less subjective pain that the other subjects is reported as being more attractive to nursing intervention”

Bronchscopy
“Exposure to nature sights and sounds before, during and after bronchoscopy is a safe, easy-to-use inexpensive means to enhance analgesia with none of the risks and side effects caused by medication”

Coronary Care
“Anxiety would be reduced by relaxing music in patients with myocardial infarction”
Bolwek, C.A., The effects of relaxing music on state anxiety in myocardial infarction patients, Heart & Lung Vo. 16, No. 3, May 1987 331

Day Surgery / Recovery
“The selected postoperative patients who listened to music during the first 48-hr period after surgery used lesser pain-relief medications”.
Locsin, R., G., R., A., C., The Effect of Music on the Pain of Selected Postoperative Patients, The ANPHI Papers, April-September1979,1-10
### Design Prescription

<table>
<thead>
<tr>
<th>Dept/Room</th>
<th>Typical Environment</th>
<th>Activities</th>
<th>Patient condition</th>
<th>Patient Emotion</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resuscitation bay AE 46</td>
<td>The resus room is 5 bay open design with overhead x-ray gantry.</td>
<td>Children with category one conditions such as Major Trauma, Respiratory distress/failure/amaet. Serious burns etc.</td>
<td>Life-threatening e.g., Unconscious, Major trauma, Resp/cardiac arrest</td>
<td>Upset/distressed/frightened, Aneicis, Happy??, Painful procedures, Unconscious, Distressed, In pain</td>
<td>The 4 other bays in the same room will be used for assessing and treating adults with same category conditions.</td>
</tr>
<tr>
<td>2 areas named Clinics/office AE 53 and 59 which are both adjacent to the waiting area</td>
<td>Couch for examination, Consultant desk area</td>
<td>Clinical use for children presenting with non-urgent injuries and conditions, Use this area to prepare children for more advanced procedures such as suturing, application of plaster of Paris etc.</td>
<td>Lower priority injuries E.g., cuts/abrasions, Bruises, Minor soft tissue injuries, Foreign bodies ear/nose etc.</td>
<td>Upset/distressed/frightened, Aneicis, Happy??, Painful procedures, Unconscious, Distressed, In pain</td>
<td>Area is immediately adjacent to the waiting area.</td>
</tr>
<tr>
<td>Play area AE 55</td>
<td>3 walled play area with simple opening leading from the main waiting room; Reduced ceiling height; TV to display video's</td>
<td>Play area for 'small' children, Well injured children and their toddler siblings.</td>
<td>Distracted by the play therapy</td>
<td>Area is designed to specifically target the smaller child.</td>
<td></td>
</tr>
</tbody>
</table>

### Emotional / Environmental Prescription

<table>
<thead>
<tr>
<th>Dept/Room</th>
<th>Light</th>
<th>Colour</th>
<th>View</th>
<th>Art</th>
<th>Sound</th>
<th>Touch</th>
<th>Smell</th>
<th>Taste</th>
<th>Space</th>
<th>Time</th>
<th>Key factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resuscitation bay AE 46</td>
<td>Not necessary</td>
<td>Full spectrum, Dimmable</td>
<td>Not necessary</td>
<td>Not necessary; Child too traumatized</td>
<td>Acoustic attenuation required</td>
<td>Avoid sharp arisises on equip + furniture</td>
<td>Avoid medical smells which may instill fear; Fixed aroma box</td>
<td>Beware! children will chew, gnaw, bite furniture + fabrics, Toxic materials</td>
<td>Generous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE59 offers N.light</td>
<td></td>
<td></td>
<td>Full spectrum, dimmable</td>
<td>AE 59 to have view</td>
<td>Overhead artwork: essential; Curtain design?</td>
<td>Avoid sharp arisises on equip + furniture</td>
<td>Avoid medical smells which may instill fear; Fixed aroma box</td>
<td>Beware! children will chew, gnaw, bite furniture + fabrics, Toxic materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play area AE 55</td>
<td>Essential</td>
<td>Full spectrum, dimmable</td>
<td>if possible</td>
<td>Essential to distract and engage children, music</td>
<td>Sound attenuation required</td>
<td>Toys infection?</td>
<td>Avoid clinical smells which may instill fear</td>
<td>Beware! children will taste chew, gnaw furn./ fabrics, Toxic material</td>
<td>Scale important</td>
<td>No clocks</td>
<td>Can be used as ‘calming’ room or ‘Happy Room’</td>
</tr>
<tr>
<td>Trauma Manifestation</td>
<td>Light</td>
<td>Artificial</td>
<td>Colour</td>
<td>View</td>
<td>Art</td>
<td>Sound</td>
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</tr>
<tr>
<td>Claustrophobia</td>
<td>Natural Good Quality</td>
<td>South Facing</td>
<td>Full spectrum polarising</td>
<td>Reflect off ceilings and walls</td>
<td>Avoid dark colours, No primary colours opposite each other</td>
<td>External views/ low sills</td>
<td>Distracting, Parallel floor patterns to pull space apart</td>
<td>Reducing / Attenuating</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Violence / Aggression</td>
<td>Controllable Avoid lux levels</td>
<td>North light better</td>
<td>Reduced light levels</td>
<td>Dimmable Blue light</td>
<td>Avoid Reds and Oranges Pastels, Blues of Greens are good</td>
<td>External busy and distracting</td>
<td>Distracting well secured</td>
<td>Reducing / Attenuating</td>
<td>No challenging materials ——— Comfortable but robust</td>
<td>Baby smell</td>
<td></td>
</tr>
<tr>
<td>Drug / Solvent Abuse</td>
<td>Controllable Avoid lux levels</td>
<td>North light better</td>
<td>Reduced light levels</td>
<td>Dimmable Blue light</td>
<td>Avoid reflections</td>
<td>Avoid glare</td>
<td>External busy and distracting, Recognise day / night cycle</td>
<td>Avoid totally</td>
<td>Reducing / Attenuating</td>
<td>No challenging materials</td>
<td>Comfortable but robust</td>
</tr>
</tbody>
</table>

The Patient
## Emotional / Environmental Prescription

<table>
<thead>
<tr>
<th>Trauma Manifestation</th>
<th>Light</th>
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<th>Time</th>
<th>Key factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bulimia</strong></td>
<td>Natural</td>
<td>Full spectrum polarising</td>
<td>Uplifting colours</td>
<td>Good views of landscape</td>
<td>Avoid images of body or figures</td>
<td></td>
<td>Control of smell, Good vent to extract vomit smells</td>
<td>Control access to food</td>
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<tr>
<td></td>
<td>Artificial</td>
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</tr>
<tr>
<td><strong>Anorexia</strong></td>
<td>Natural</td>
<td>Full spectrum polarising</td>
<td>Uplifting colours</td>
<td>Good views of landscape</td>
<td>Avoid images of body or figures</td>
<td>Intolerance to cold temp control Good relative humidity levels</td>
<td></td>
<td>An issue</td>
<td></td>
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<tr>
<td></td>
<td>Artificial</td>
<td>Warm Colours</td>
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</tr>
<tr>
<td><strong>Psychotic Disorder</strong></td>
<td>Natural</td>
<td>Reflected off ceilings and walls. North Facing Indirect sunlight constant. Dimmable. Avoid reflections and glare.</td>
<td>Reflected off ceilings and walls. Soft/ reduced levels/pinky orange/ sleep inducing Dimmable Avooid reflections and glare</td>
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<tr>
<td></td>
<td>Artificial</td>
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</tr>
<tr>
<td></td>
<td>Good Quality South Facing</td>
<td>Good Quality South Facing</td>
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</tbody>
</table>

### The Patient

- **Psychotic Disorder**
  - Good Distractioning countryside views
  - No contrasting textures. Cocooning soft materials with heavy guage (affirmation of existence) avoid floating materials.
  - Grounding and reality based. Photographs perhaps Black and White. No abstract or cubism. No free interpretation.
  - Calming White noise. 70/80 bpm Heart rate, major keys.

### Key factors
- Generous, Square, proportions.
- Not constraining
- Must promote psychological security and clarity of thought. Must be allowed to distinguish reality from imagination and feel, calm relaxed and secure.

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*Design Prescription*

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**Innovative Thinking in Healthcare Design**

**Richard Mazuch**

**March 19, 2015**
Design Prescription

- The Department
- Room / Space
- The Patient
Optimum Healing Environments

- Optimum healing environment identified on smart card
- Access to single acute, inpatient bedroom
- Activates Building Management System
- Automatic Environmental recalibration of natural light, artificial light, temp, colour, humidity, ventilation, etc.
## EBD Sensory Spreadsheets

### SENSES

<table>
<thead>
<tr>
<th>SIGHT</th>
<th>SOUND</th>
<th>TOUCH</th>
<th>SMELL</th>
<th>TASTE</th>
<th>SPACE</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL LIGHT</td>
<td>ARTIFICIAL LIGHT</td>
<td>VIEW</td>
<td>ART</td>
<td>NATURAL SOUND</td>
<td>MUSIC</td>
<td>TEXURE</td>
</tr>
<tr>
<td>Access to daylight</td>
<td>Appropriate Lighting</td>
<td>Views of Nature</td>
<td>Carpentry</td>
<td>Temperature</td>
<td>Pleasant</td>
<td>Odours</td>
</tr>
</tbody>
</table>

### DIAGNOSTIC BODY SYSTEMS

#### Health Outcomes

- **Auto-Nomic / Physiological**
  - Stress
  - Depression
  - Pain

#### Motor

- Falls
- Injuries
- Length of stay

#### Static

- HAI
- Sleep
- Pain
- Satisfaction

- **X** - Patients
- **XX** - Staff

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**Innovative Thinking in Healthcare Design**

Richard Mazuch

March 19, 2015

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Sensory Plans

- Offers another level of data that no other design protocol offers
- Spaces are rigorously evaluated to address individual senses
- Identifies unforeseeable problem areas
- This process analysis helps deliver optimal healing environments
Emotional Mapping

- Emotional Mapping is a new and exciting innovative design tool
- Enables clinicians and designers to navigate through the emotions, feelings, sentiments and sensations of patients
- This allows potential flashpoints to be easily identified.
Emotional Mapping

- Emotions inhabit every space
- Plans identify predominant patient emotions
- Enables designers to create de-stressing, healing, destigmatising and therapeutic spaces
One can group predominant emotions that inhabit large building blocks, departments, etc. and indeed single rooms and spaces.

Lakewood Regional Secure Care Centre, Bangor, Northern Ireland
The patients’ predominant emotion will be identified on a set of colour rendered plans.

Coventry Children’s Hospital, UK
Sensory Spaces

- Healing Spaces
- Dental Clinic
Sensory Spaces

- CT/MRI
- Plain film x-ray
- Ward ceiling
Sensory Spaces

- CT/MRI
Sensory Spaces

- Post-Op Recovery
- Medical / Surgical Bedspaces
Sensory Spaces

- Linear Accelerator
- MRI/CT
- Dental treatment
• Cyber Knife
Mount Vernon Hospital
Sensory Spaces

- Multi-sensory environments
- Snoezelen
Multi Sensory Space / Room
### Design Interventions

<table>
<thead>
<tr>
<th>Dept / Patient Group</th>
<th>Design Intervention</th>
<th>Outcome</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICU Neonates</td>
<td>Cycled light.</td>
<td>More weight gain. Fed orally sooner and spent fewer days on ventilator =£$€</td>
<td>Miller, White, Whitman - 1995</td>
</tr>
<tr>
<td>Coronary Care Unit.</td>
<td>Daylight/sunlight penetration.</td>
<td>“Patients stayed a shorter time in sunny rooms”. “Mortality was consistently higher in dull rooms”.</td>
<td>Beauchamps -1998.</td>
</tr>
<tr>
<td>Dept / Patient Group</td>
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</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Bipolar Depressed Patients.</td>
<td>East facing rooms exposed to morning sunlight.</td>
<td>3.67 shorter stay than those in western facing rooms.</td>
<td>Benedetti ; F Columbo 2001.</td>
</tr>
</tbody>
</table>
## Design Interventions

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</tr>
</thead>
<tbody>
<tr>
<td>MH Bedroom – Patient with Bipolar Depression and SAD.</td>
<td>Sunny rooms.</td>
<td>16.9 days stay v 19.5 days in dull room.</td>
<td>Beauchem et al 1998.</td>
</tr>
</tbody>
</table>
## Design Interventions

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</tr>
</thead>
<tbody>
<tr>
<td>Adult Acute Patients</td>
<td>White noise</td>
<td>&quot;Available intervention to faster optimal sleep patterns in post-op CABG patients&quot;.</td>
<td>Williamson, J.W – 1992</td>
</tr>
<tr>
<td>Post Op Recovery Patients</td>
<td>Low/high noise levels.</td>
<td>&quot;Sensation of post operative pain increased as noise levels increased&quot;. More painkillers, medication needed.</td>
<td>Minckley B.B et al - 1968</td>
</tr>
</tbody>
</table>
“The very first requirement in a hospital is that it should do no harm to the sick”
Florence Nightingale, 1859
Design Decision

- Physiological condition
- Emotional condition
- Psychological condition
- Physical condition
We have powerful tools at our disposal.

Let us use them to good effect!

We can create the most powerful healing environments.
Thank you