



Occupational Health Clinics
for Ontario Workers Inc.

Finding Patterns of Illness and Injury

2005 CAW
Workers Compensation Conference
Port Elgin

John Oudyk CIH, ROH
Occupational Hygienist
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OHCOW's experience

- see individuals with WSIB claims to evaluate work-relatedness
- answer questions about work-relatedness and prevention of workplace symptoms
- investigate group concerns of work-related illness/injury (intake clinics)



Nick's Question:

- can we come up with about 20 simple questions which could screen for occupational disease in the workplace?



Simple Answer to Nick's Question:

- we wish!



What do we have (validated)?

- 9 question screening survey for asthma
- 7 question hearing loss screening survey
- 6 question vibration white finger survey
- 16 question neurological symptom survey
- 5 question chronic bronchitis survey
- ergonomic symptom survey
- job strain survey
- IAQ symptom survey



Why do we need validated questions?

- recognition
- comparison purposes
- diagnosis purposes
- repeatability
- validity
- false positives, false negatives



Exposure/Health Continuum:

Primary (1°)
Prevention

Secondary (2°) Tertiary (3°)
Prevention Prevention

SOURCE > PATH > EXPOSURE > UPTAKE > BIOL

CHANGE

source	dispersion	inhale	absorb	disease
vibration	transmission	noise	hearing	NIHL
repetitive motion	muscles/ tendons	repeated movements	pain	MSI



Prevention:

- **3° prevention** is “mopping up”, “counting the bodies” – getting recognition for work-relatedness → WSIB
- **2° prevention** is screening for early signs of disease in the hope you can change the outcome if you intervene early enough
- case-finding can be both – 2° prevention if you catch it early, but if you wait long enough it will be 3° prevention



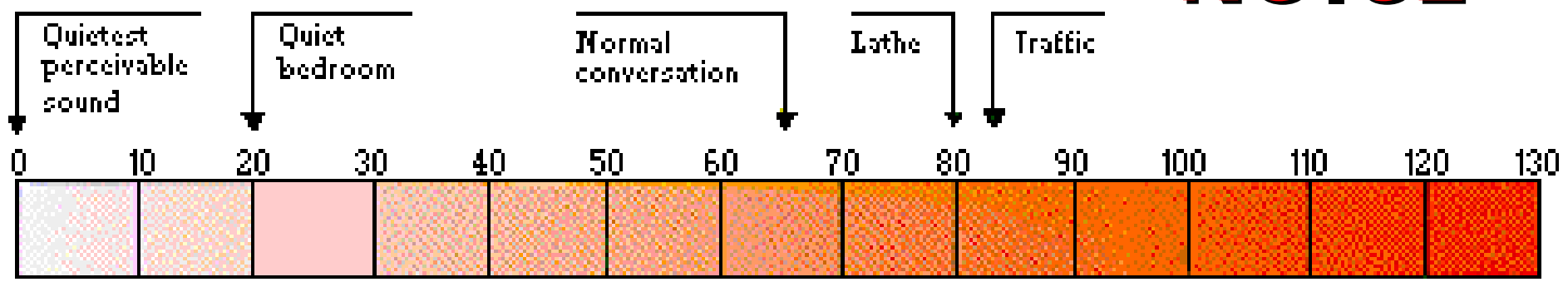
Natural History of Disease

- hearing loss
- asthma
- dermatitis
- musculo-skeletal injuries (MSI)



The Decibel Scale Some typical sound levels

NOISE

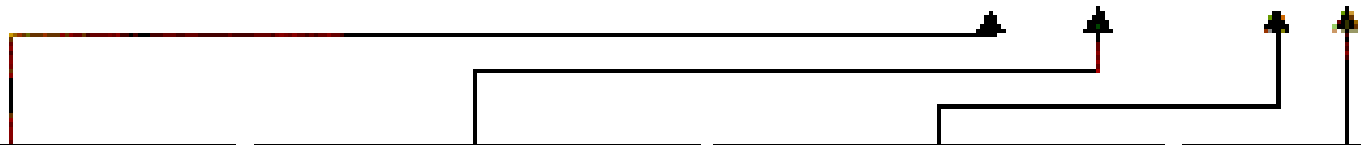
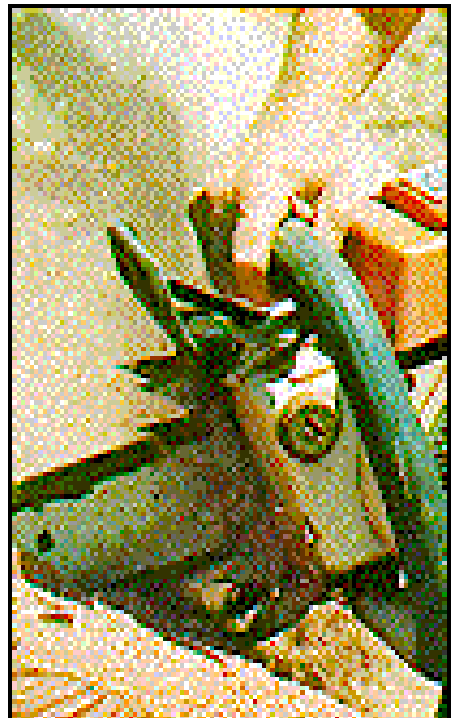


Front end loader

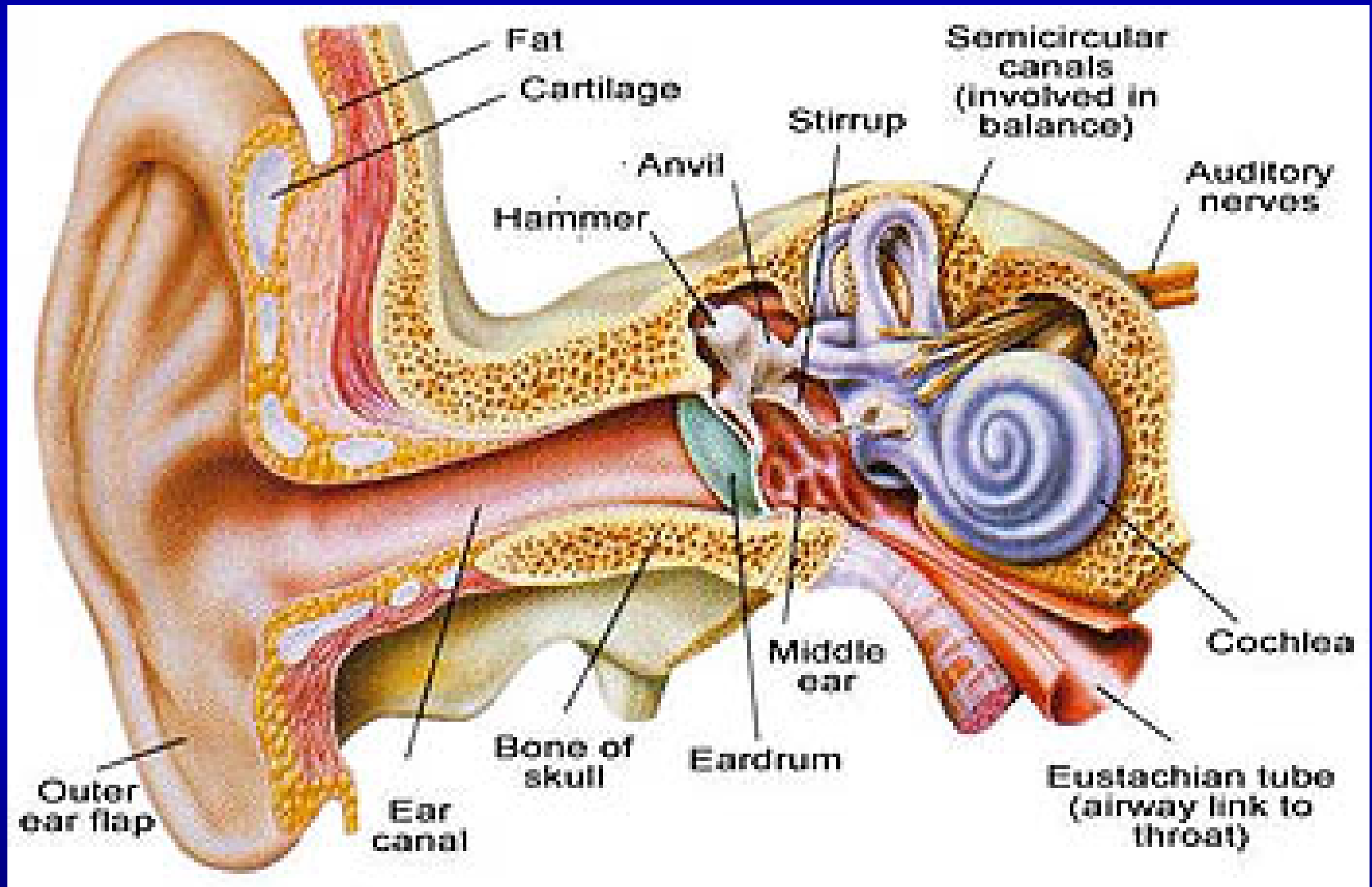
Lawn mowing

Grinding

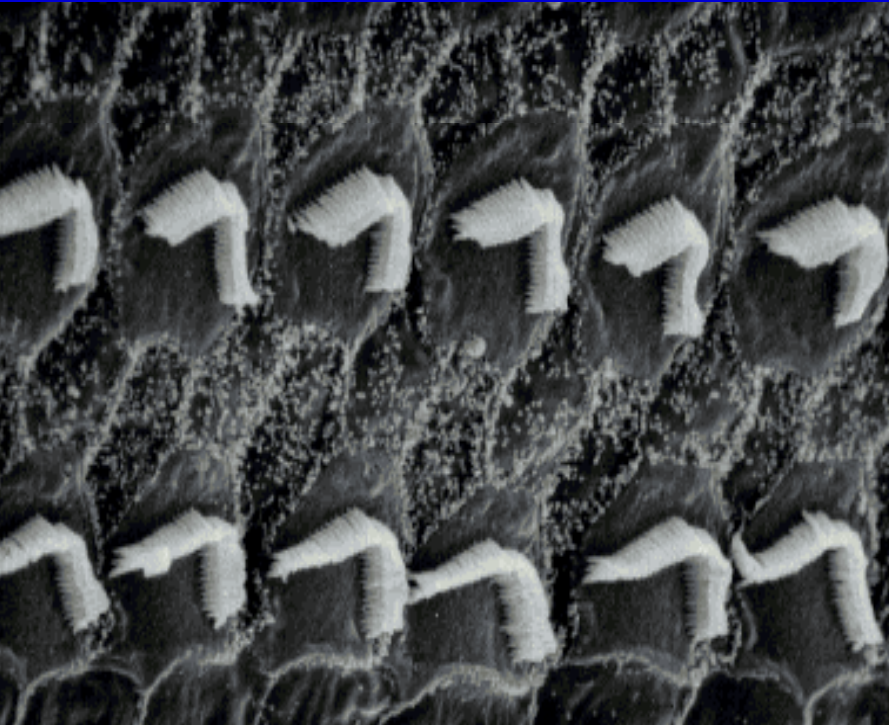
Chainsaw



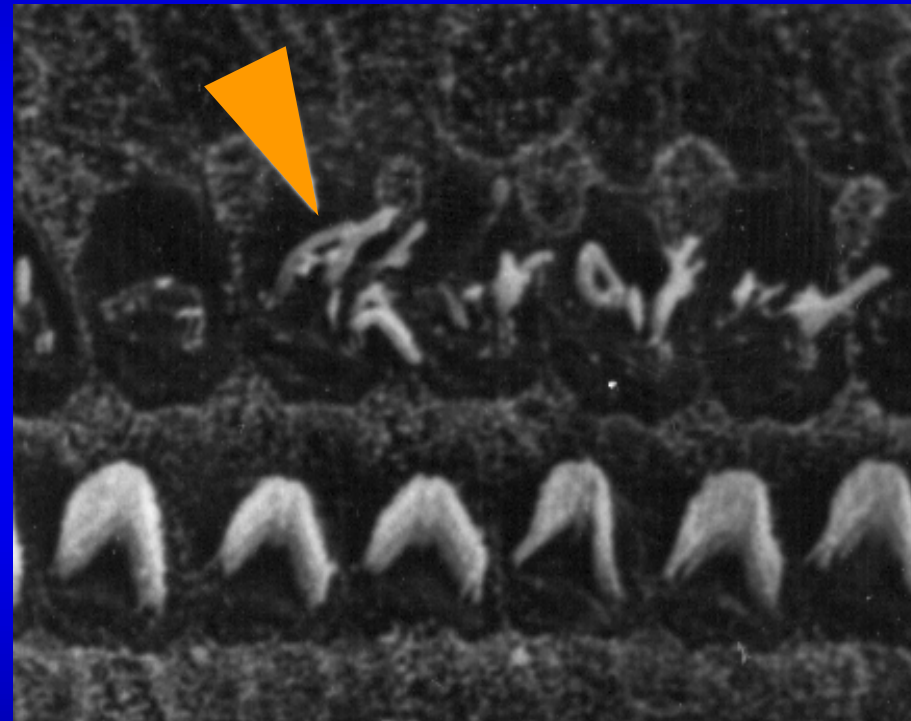
the ear (what you can't see)



...what noise does ...



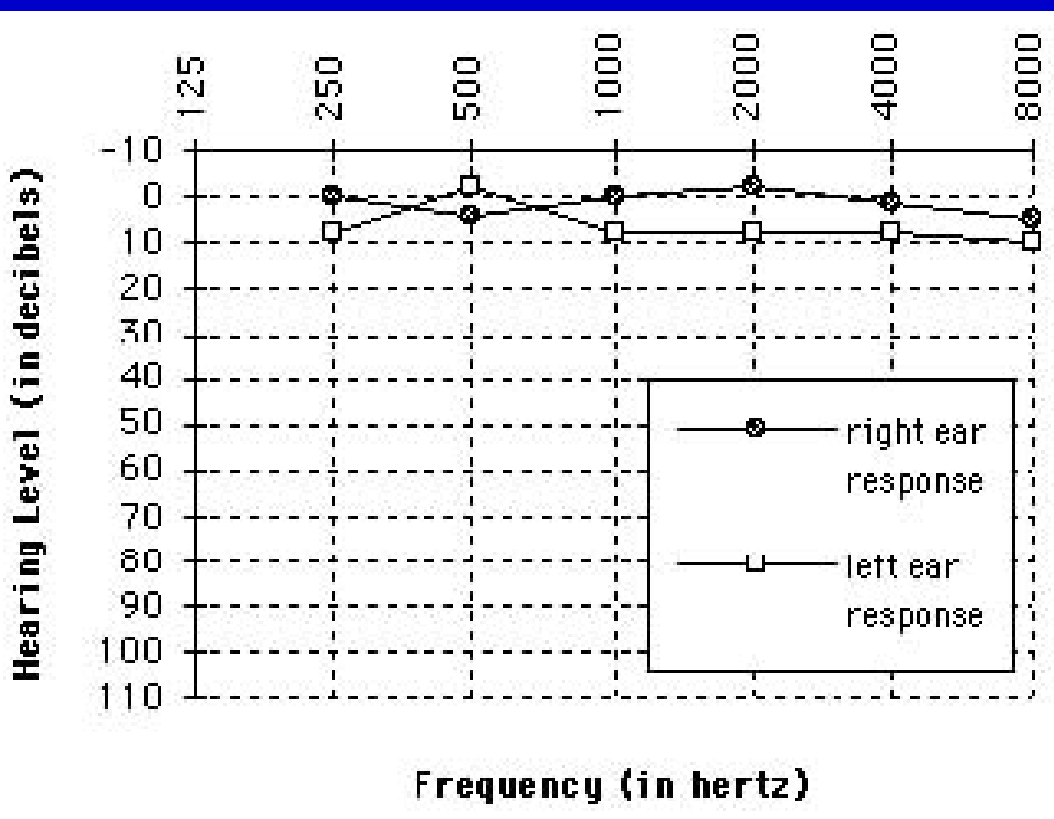
normal hearing cells



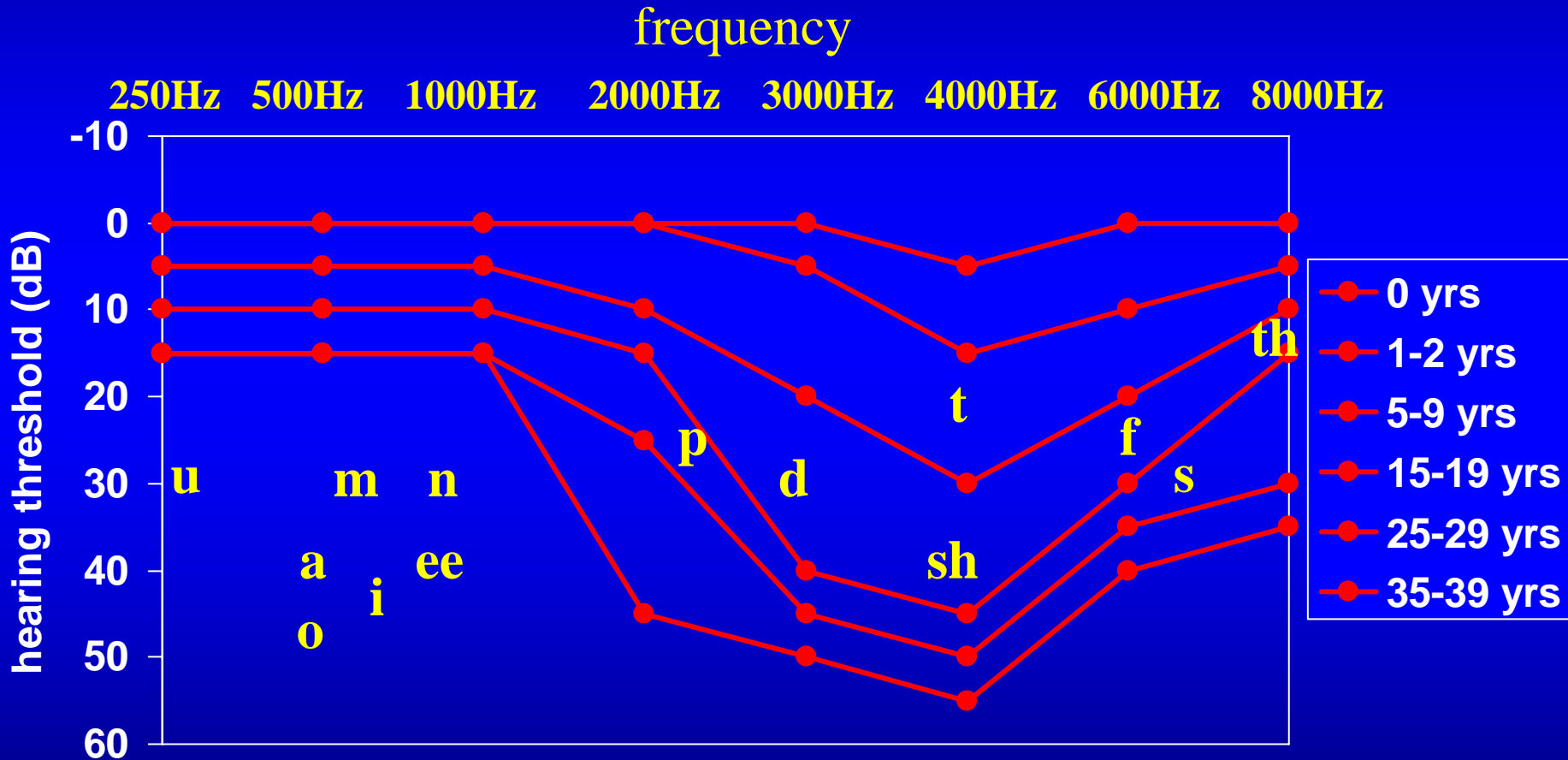
damaged hearing cells



how its measured



progression of NIHL (noise induced hearing loss)

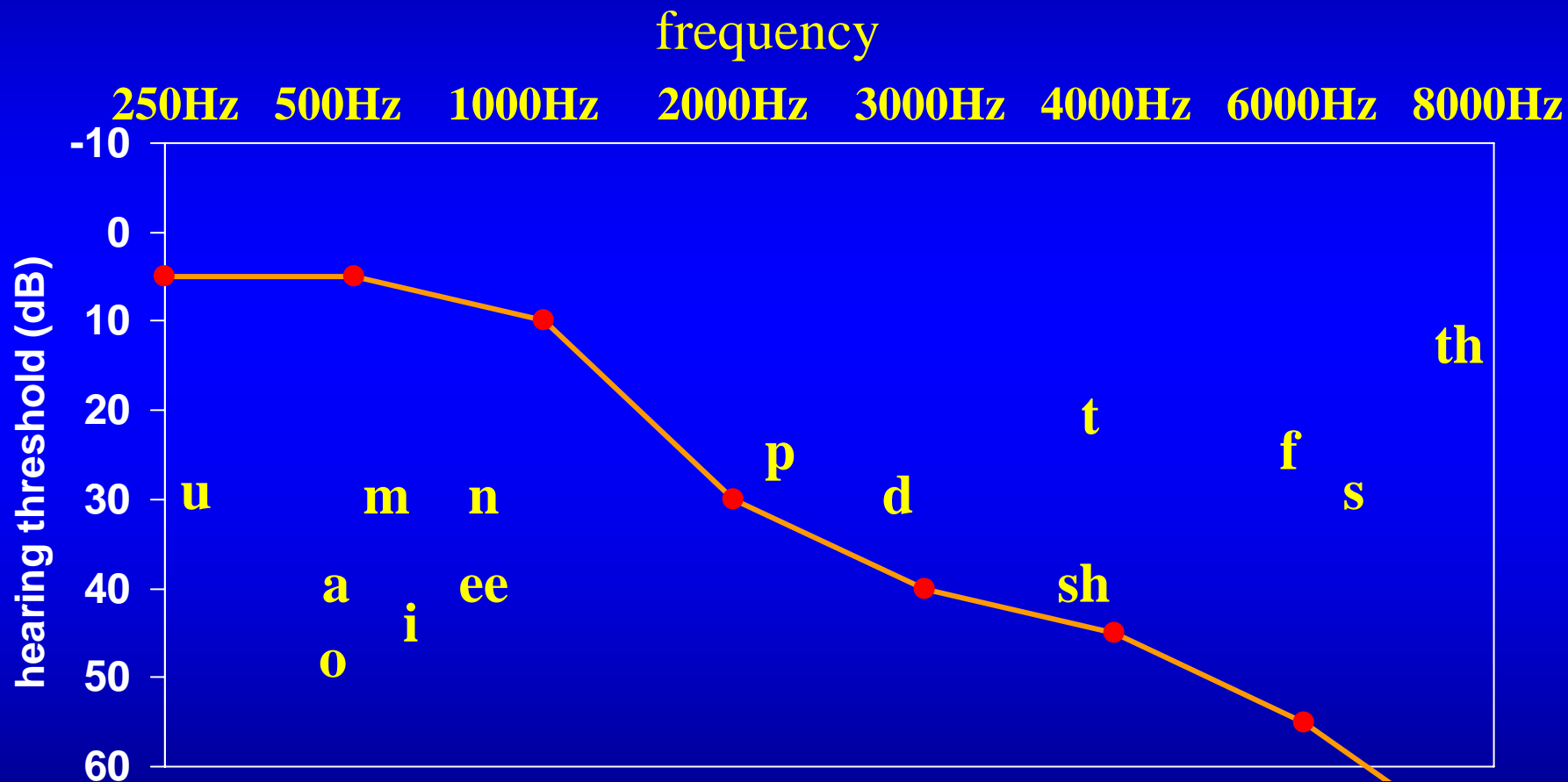


what are the chances?

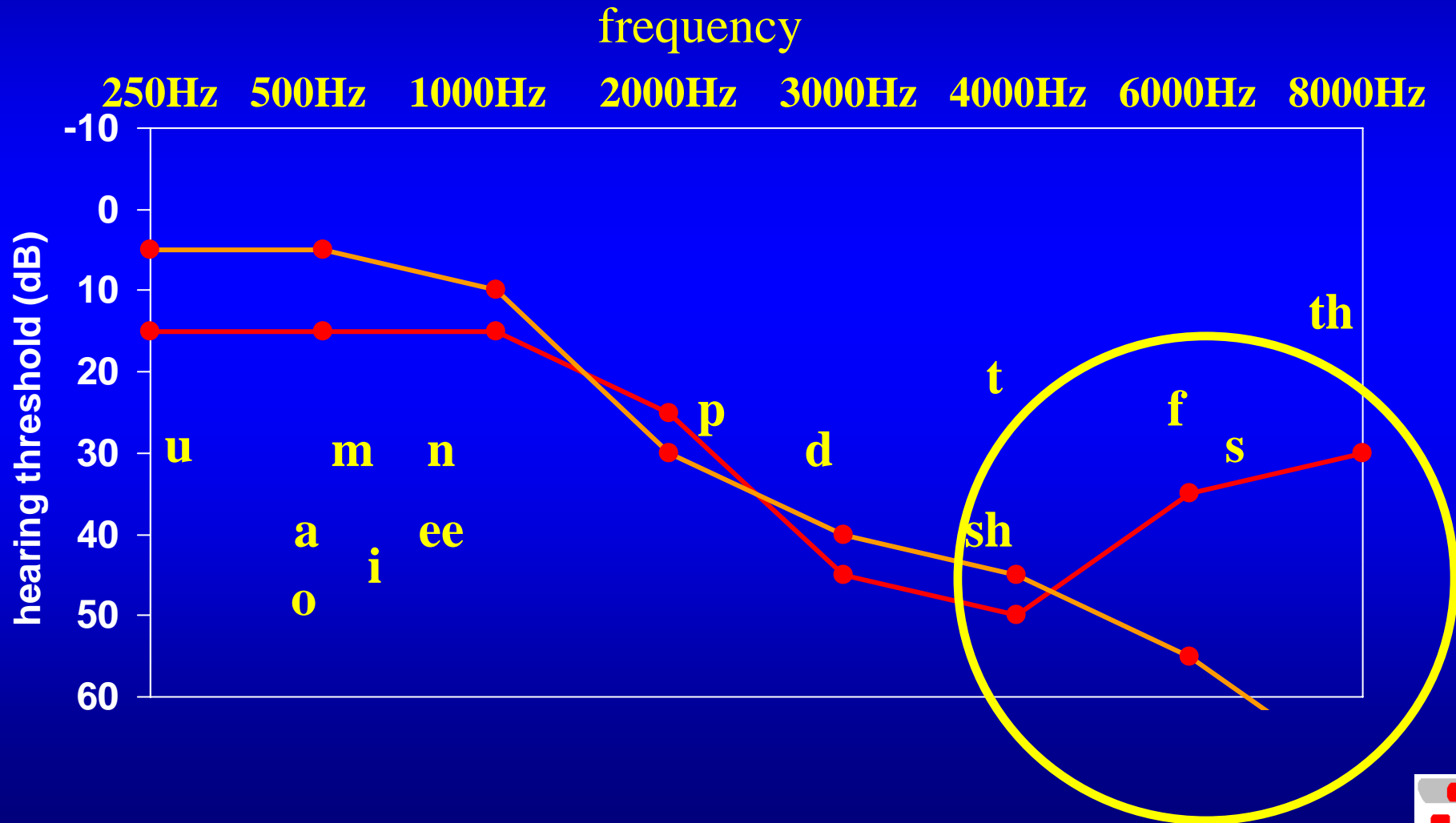
- depends on the intensity of the noise (how loud it is – measured in decibels (dBA))
- depends on the frequency – high pitch (treble) sounds more damaging than low (bass) sounds
- depends on the length of time exposed (yrs)
- depends on the age (natural hearing loss due to age - presbycusis)



presbycusis (age hearing loss)



presbycusis (age hearing loss)



hearing loss calculator

Age	Normalized 8hr Level	Years of exposure
50	86	30
Male	HTLAN 25 dB	mean of 1, 2 & 4kHz
<input type="button" value="Clear"/> <input type="button" value="Compute"/> <input type="text" value="14 %"/>		



hearing loss due to age

Age	Normalized 8hr Level	Years of exposure
50	0	30
Male	HTLAN 25 dB	mean of 1, 2 & 4kHz

Clear Compute 9 %



Noise: Ont OEL = 90 dBA

ACGIH TLV = 85 dBA

Table 3-4. Comparison of models for estimating the excess risk of material hearing impairment at age 60 after a 40-year working lifetime exposure to occupational noise, by definition of material hearing impairment

Average exposure level (dBA)	0.5-1-2-kHz definition					1-2-3-kHz definition			1-2-3-4-kHz definition	
	1971-ISO	1972-NIOSH	1973-EPA	1990-ISO	1997-NIOSH	1972-NIOSH	1990-ISO	1997-NIOSH	1990-ISO	1997-NIOSH
90	21	29	22	3	23	29	14	32	17	25
85	10	15	12	1	10	16	4	14	6	8
80	0	3	5	0	4	3	0	5	1	1

<http://www.cdc.gov/niosh/pdfs/98-126-b.pdf>



Noise:

- WSIB recognizes noise-induced hearing loss (NIHL) compensation after an exposure of 90 dBA for 8 hrs/day for 5 years;
- the policy also lists equivalent exposures as 84 dBA for 40 yrs and 28 yrs at 85 dBA



WSIB Hearing Loss Exposure Equivalencies

The minimum hazardous noise exposure of **90 dB(A)** for 8 hours per day for **5 years** has the following equivalencies*:

84 dB(A) for 40 yrs	89 dB(A) for 7 yrs
85 dB(A) for 28 yrs	91 dB(A) for 3.5 yrs
86 dB(A) for 20 yrs	92 dB(A) for 2.5 yrs
87 dB(A) for 14 yrs	93 dB(A) for 1.8 yrs
88 dB(A) for 10 yrs	94 dB(A) for 1.25 yrs

* ISO 1999-1990. Acoustics – Determination of occupational noise exposure and estimation of noise-induced impairment. Internat. Standard ISO 1990. 2nd ed. Geneva, 1990.

NIHL does not normally develop in less than 1.25 years.



How to apply knowledge of the natural progression of NIHL

- measure exposure (dB, years) → estimate expected hearing loss (age)
- screening audiometry → follow-up results annually (often save only until WSIB claim arises) – are we holding steady or is hearing declining yr to yr?
- talk to workers (hand in front of your mouth) → workers with NIHL often learn to lip read to some extent without realizing it
- temporary threshold shift (car radio volume before and after work)
- screening questions



what not to ask:

- do you have a hearing problem?
- does your spouse say you have a hearing problem (listening maybe?)?
- is it very noisy in your working area?
 - a better question would be – if you are an arm's length away from someone do you have to raise your voice to be heard?



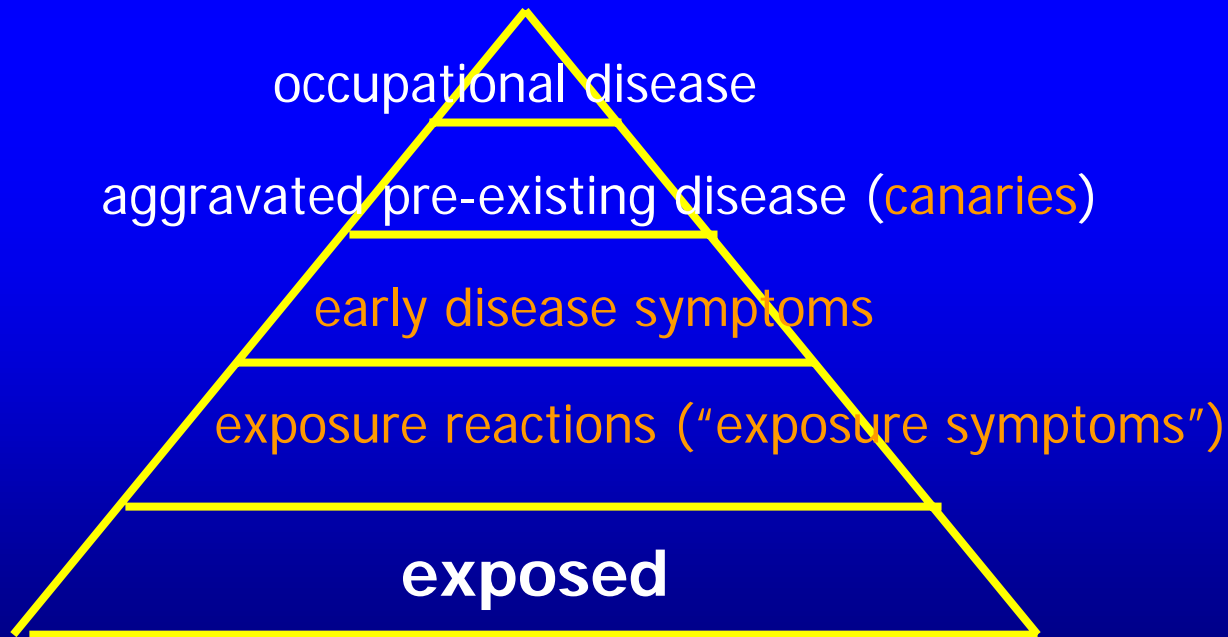
HL screening questions

Do you have difficulty hearing what is being said over the telephone ?	yes ₁	no ₂
Do you have difficulty understanding conversations within a group of people?	yes ₁	no ₂
Do people's voices sound blurry – like they are mumbling ?	yes ₁	no ₂
Do you frequently ask people to repeat themselves?	yes ₁	no ₂
Do you have ringing in the ears (or other noise such as hissing, buzzing, etc.)?	yes ₁	no ₂
Has a co-worker/family member suggested that you have a hearing problem ?	yes ₁	no ₂
Has a doctor ever told you that you have a hearing problem ?	yes ₁	no ₂

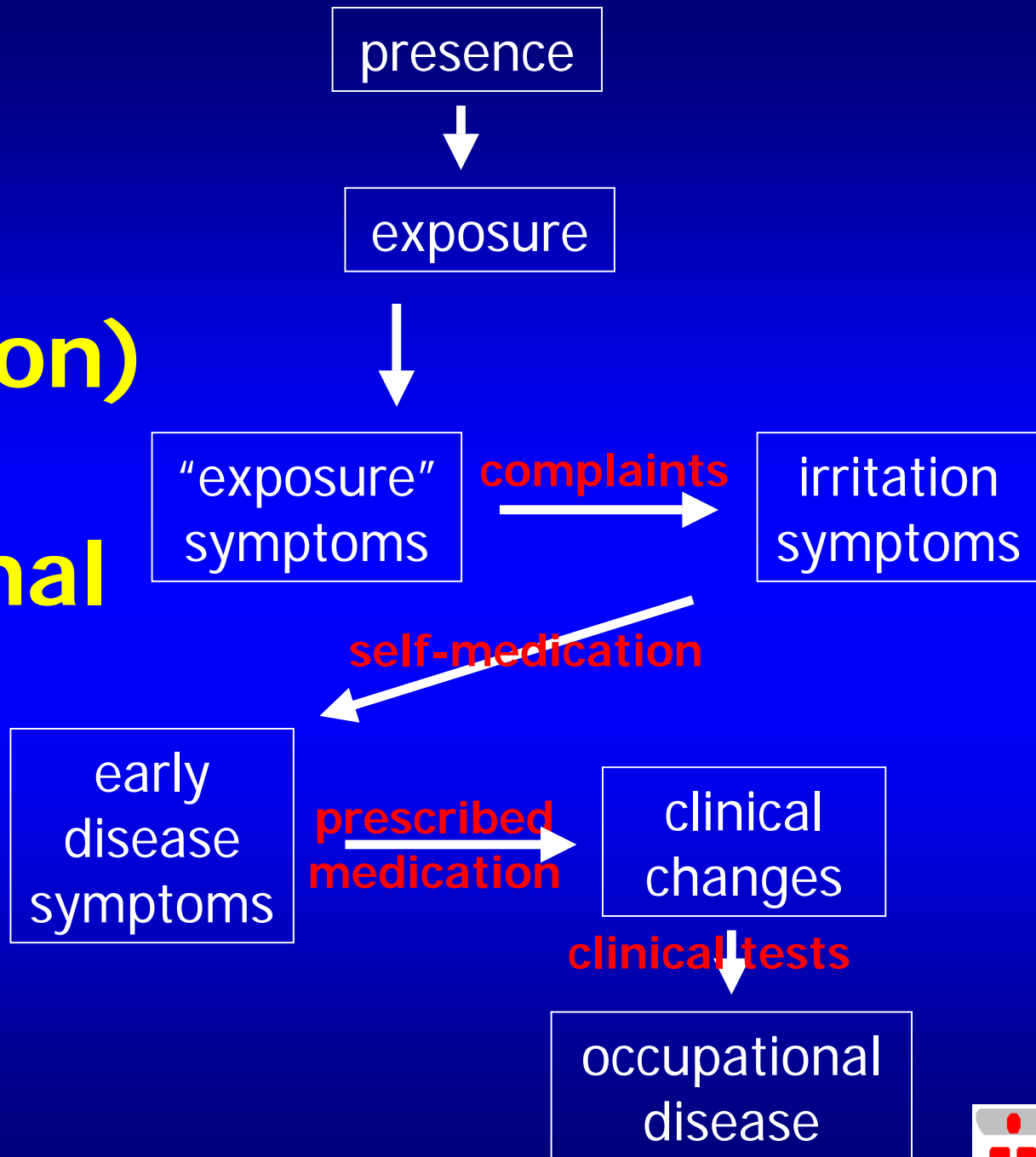


Occupational disease pyramid:

- can symptoms be viewed as lower part of the proverbial “occupational disease iceberg”?



natural history (progression) of an occupational disease



Early Symptoms:

- Dealing with only symptoms are “messy” high sensitivity, low specificity (lots of false positives)
- For instance, bronchial hyper-responsiveness (asthma) is measurable and reasonably specific - a cause can usually be identified
- Rhinitis is difficult to measure, common and easily diagnosed by examination but difficult to establish an exact cause
- Fatigue is diagnosed by questioning, is extremely common and too clinically vague

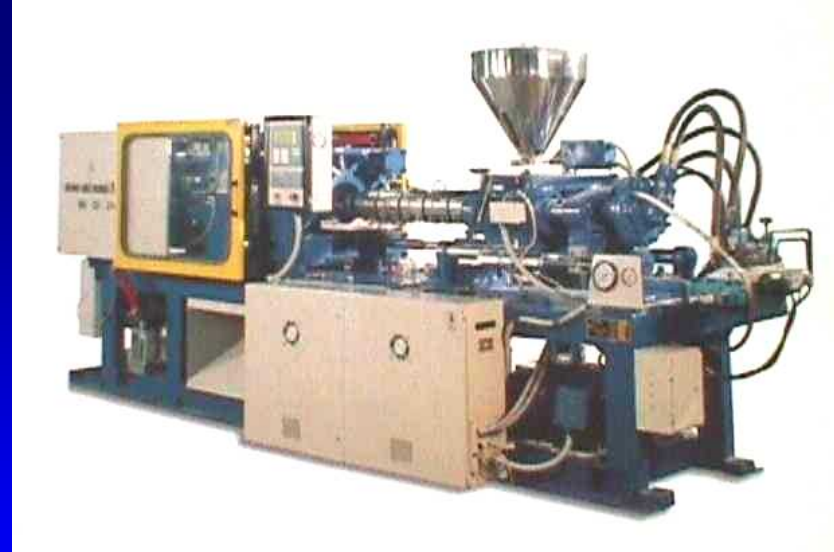


“Canaries”:

- In workplaces with irritant exposures, workers with **pre-existing** lung, eye, nose, throat or skin problems may be the first to notice symptoms
- Increased **medication usage** while at work as compared to when away is an early objective indicator
- Check with these “**canaries**” when investigating (early warning system)



example:



- worker working on a plastics injection moulding machine
- machine gets stuck and plastic (PVC) starts to burn
- worker experiences burning sensation in lungs (probably HCl along with other decomposition products)
- goes to hospital (trouble breathing) doctor diagnoses chemical burn to lung tissue (visual at back of throat) – back to work next day

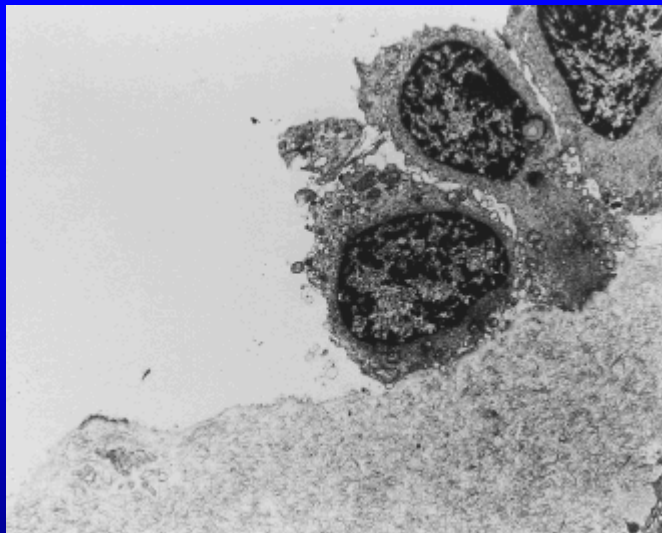


example

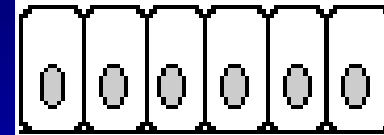
- self/prescribed medication attempts (anti-histamines, etc.) and after some immediate success with little sustained relief
- after 6 months as exposure continues become the symptoms refractory to standard treatment and patient notices lungs are reactive to a variety of irritants (perfume, smoke, etc.)
- reactivity make become irreversible after a year



changes to lung tissue

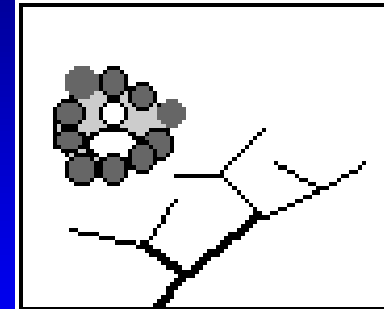


A



Respiratory epithelium

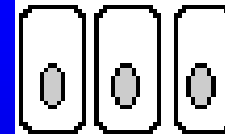
Basement membrane



Glands

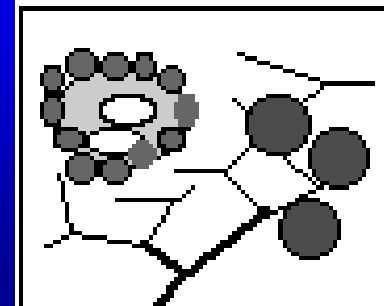
Sensory nerve fibers

B



Respiratory epithelium
tight junction defects
and desquamation

Basement membrane
thickening



Glands: hyperplasia
lymphocytic infiltrates

Sensory nerve fibers
proliferation

natural history of lung disease

- irritant/allergen exposure (presence)
- “exposure symptoms” (sudden or gradual): odour, eye/nose/throat/breathing/skin irritation
- medicating early symptoms (non-prescription)
- increasing use of medication
- complication (lung infection/severe allergic reaction)
– see physician
- stronger medication – continued exposure
- stronger medication gradually become ineffective; beginning of permanent changes (occupational disease) – begins to be clinically measurable



what are the signs to look out for

- complaints
- canaries
- medication usage (at work compared to away from work)
- length of time since symptoms started
- symptoms gradually becoming more pronounced and harder to medicate
- fellow workers starting to show similar symptoms (asthma questionnaire?)



Asthma Symptom Screening:

- A validated set of asthma screening questions (those screening positive under-went lung tests to see if they had asthma):
 - “Respiratory Symptoms Questionnaire for Asthma Epidemiology: Validity and Reproducibility”,
Thorax 48:214-219 (1993)

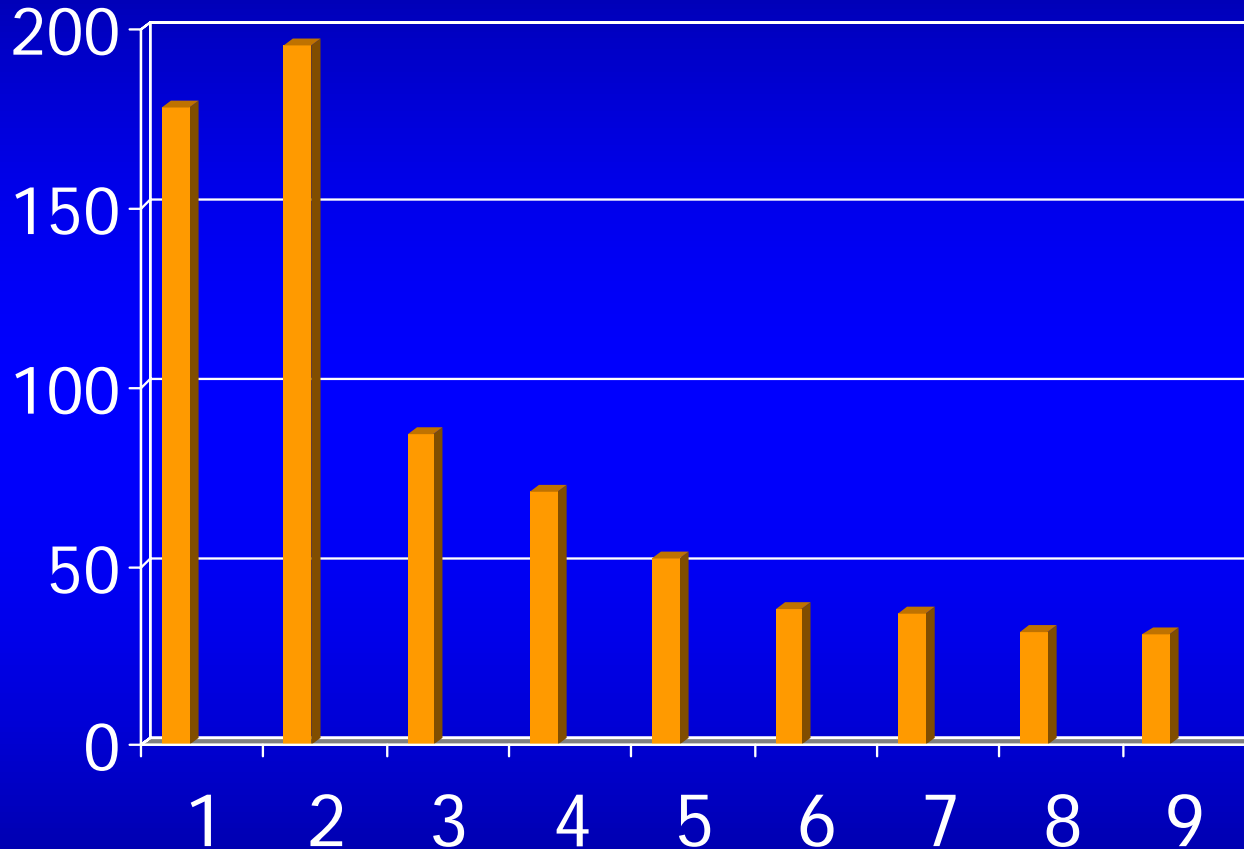


Venables' asthma screening questions

During the <u>last four (4) weeks</u> :	Yes	No
If you run, or climb stairs fast do you ever: cough? wheeze? get tight in the chest?	<input type="checkbox"/> ₁ <input type="checkbox"/> ₁ <input type="checkbox"/> ₁	<input type="checkbox"/> ₂ <input type="checkbox"/> ₂ <input type="checkbox"/> ₂
Is your sleep ever broken by: wheeze? difficulty with breathing?	<input type="checkbox"/> ₁ <input type="checkbox"/> ₁	<input type="checkbox"/> ₂ <input type="checkbox"/> ₂
Do you ever wake up in the morning with: wheeze? difficulty with breathing?	<input type="checkbox"/> ₁ <input type="checkbox"/> ₁	<input type="checkbox"/> ₂ <input type="checkbox"/> ₂
1. Do you ever <u>wheeze</u> if: you are in a smoky room? you are in a dusty place?	<input type="checkbox"/> ₁ <input type="checkbox"/> ₁	<input type="checkbox"/> ₂ <input type="checkbox"/> ₂



Asthma Screening Results:

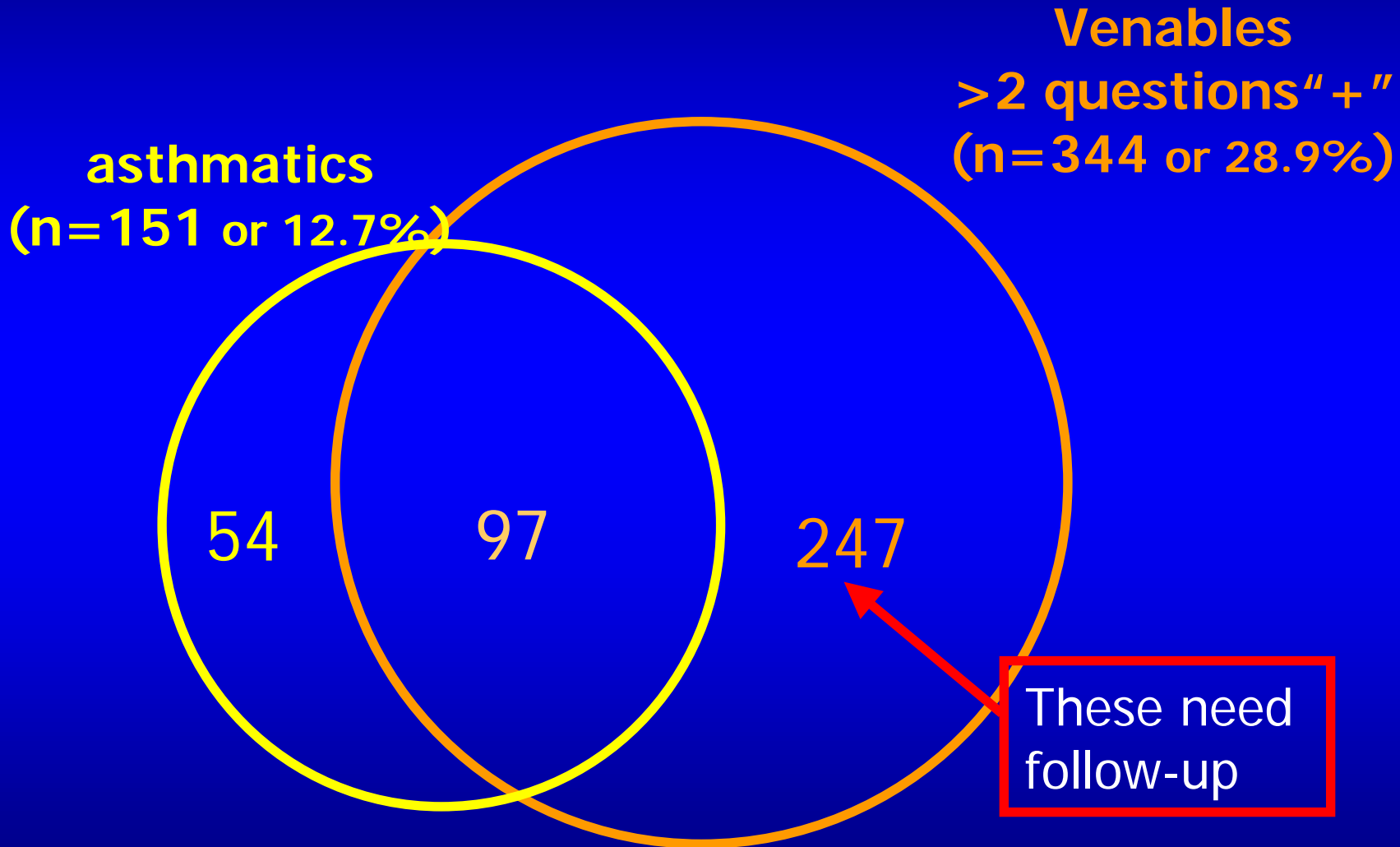


number of questions answered positively

(428/1203 respondents did not have any positive responses)



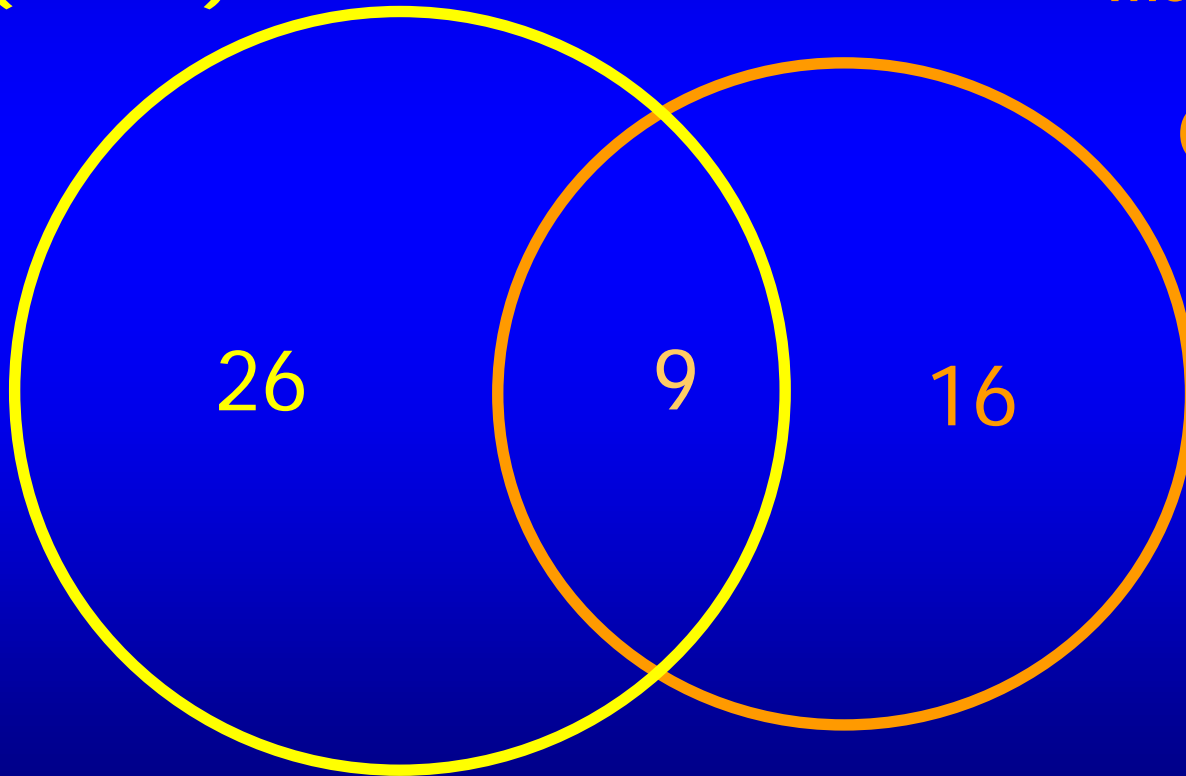
Asthma Screening Results:



Asthma follow-up (n= 153) Results:

asthmatics
(n= 35)

methacholine
" + "
(n=25)



"accuracy" of screening:

	metchl +	metchl -	total
asthma Hx +	9	26	35
asthma Hx -	16	102	118
total	25	128	153

25/153 (16%) true positives

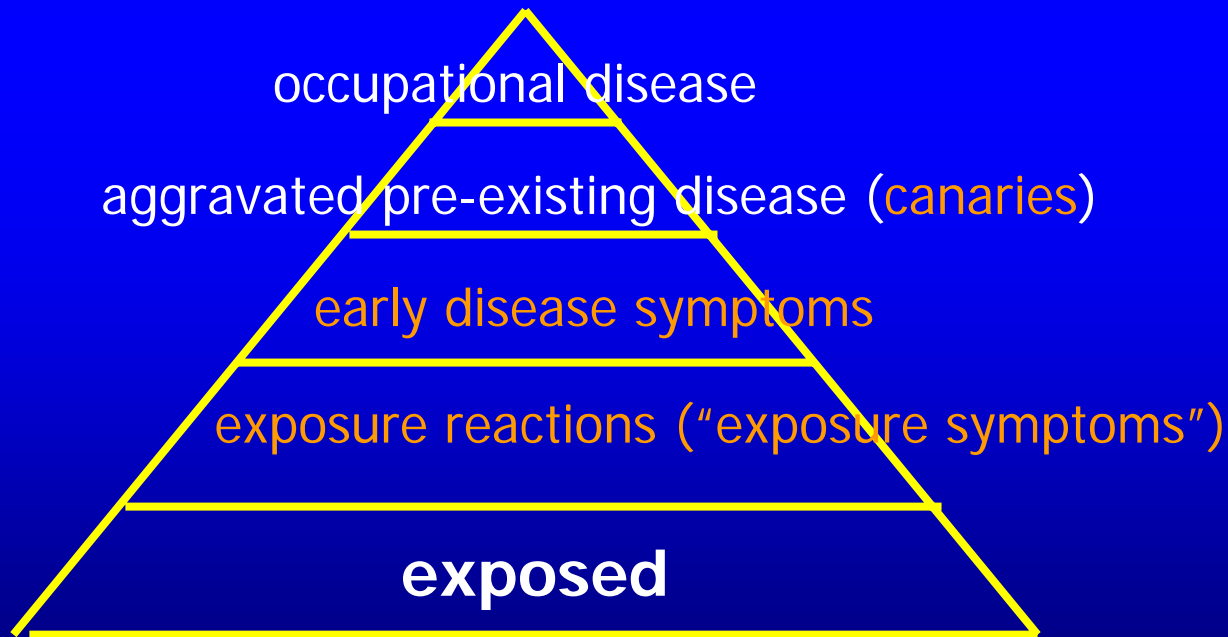
128/153 (84%) "false" positives

... but, do the "false" positives have symptoms?



Occupational disease pyramid:

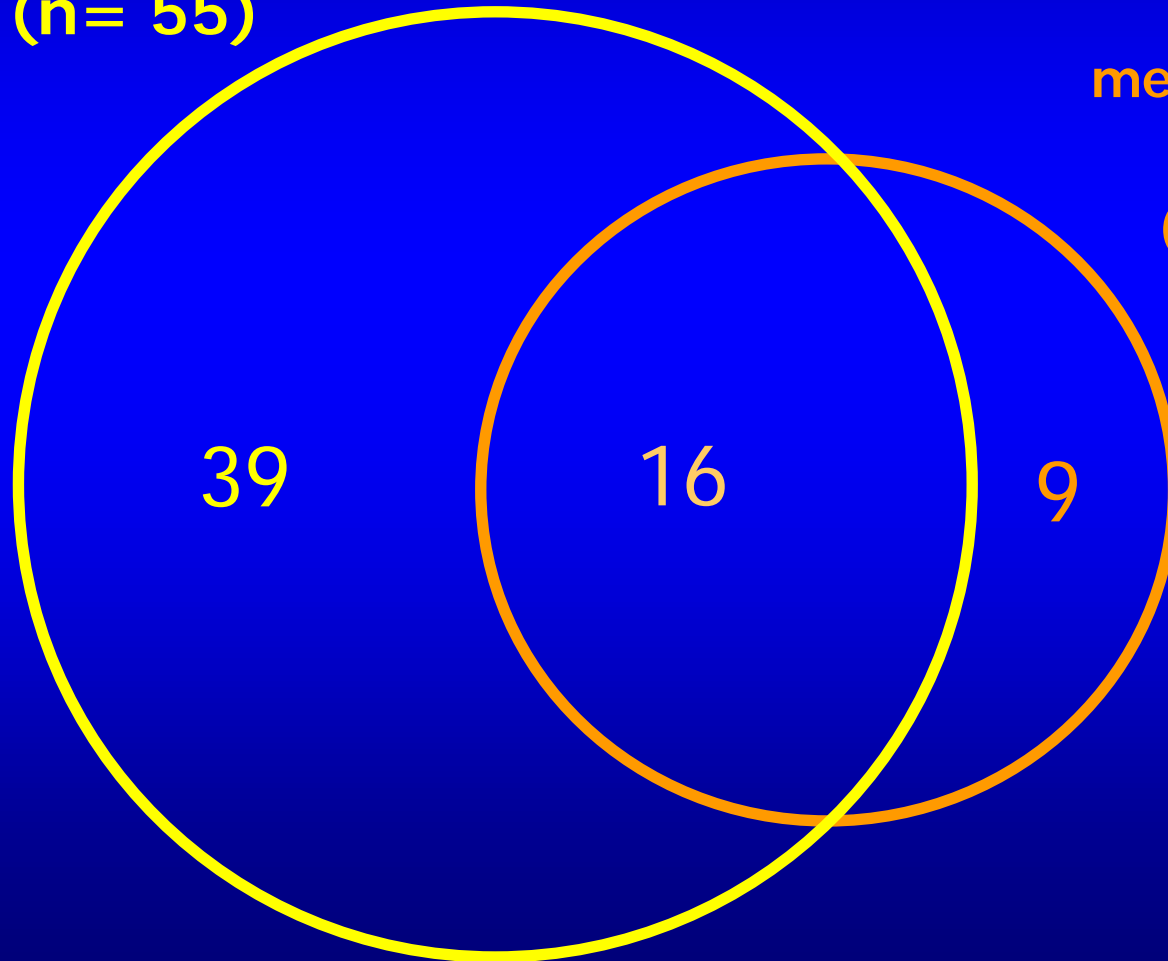
- can symptoms be viewed as lower part of the proverbial “occupational disease iceberg”?



Asthma follow-up (n= 153) Results:

ever use
puffers
(n= 55)

methacholine
" + "
(n=25)



"accuracy" of screening:

	metchl +	metchl -	total
puffer use +	16	39	55
puffer use -	9	89	98
total	25	128	153

of those using puffers: $16/55$ (29%) true positives

of those not: $9/98$ (9%) true positives

... "have you ever used puffers?" is a better screening question for asthma than "do you have asthma?"



screened group (n=153)

variable	methacholine +	methacholine -	p=
Venables score	5.9	5.0	0.056
asthma Hx	36%	20%	0.143
current puffers	36%	10%	0.017
ever puffers	64%	30%	0.003
smoking (in pk-yrs)	19.8	12.7	0.035
years in current job	6.9	12.8	0.0002
years in comp plnt	13.5	16.9	0.042



natural history of dermatitis:

- irritant/allergen exposure (presence)
- “exposure symptoms” (sudden or gradual): skin reaction
- medicating early symptoms (non-prescription)
- increasing use of medication
- persistence/spread – see physician
- stronger medication – continued exposure
- stronger medication gradually become ineffective; beginning of permanent changes (occupational disease)

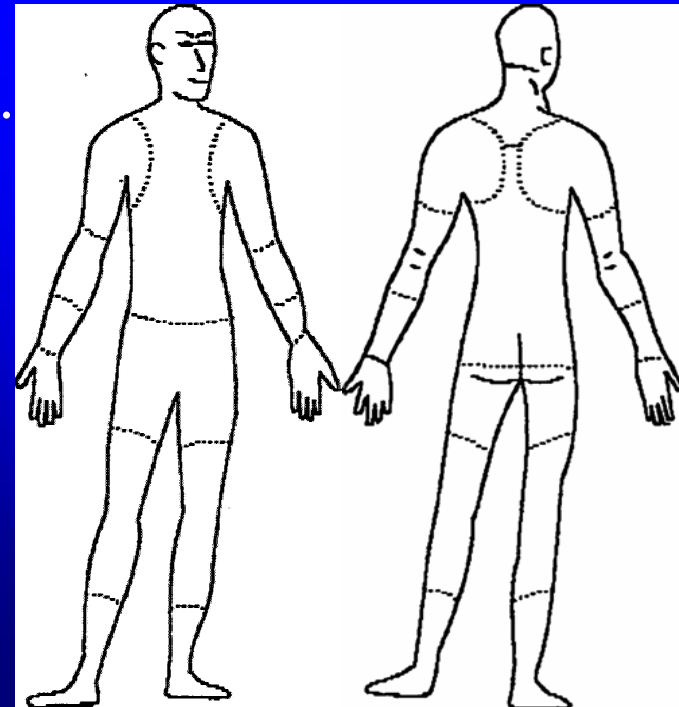


Dermatitis screening survey:

When did you last have a rash/skin problem? (check all that apply)

- I have it now
- I don't have it now but had it within the last 3 months
- I had it between 3 – 6 months ago.
- I had it between 6 – 12 months ago.
- I had it more than 12 months ago.
- I have never had a skin problem

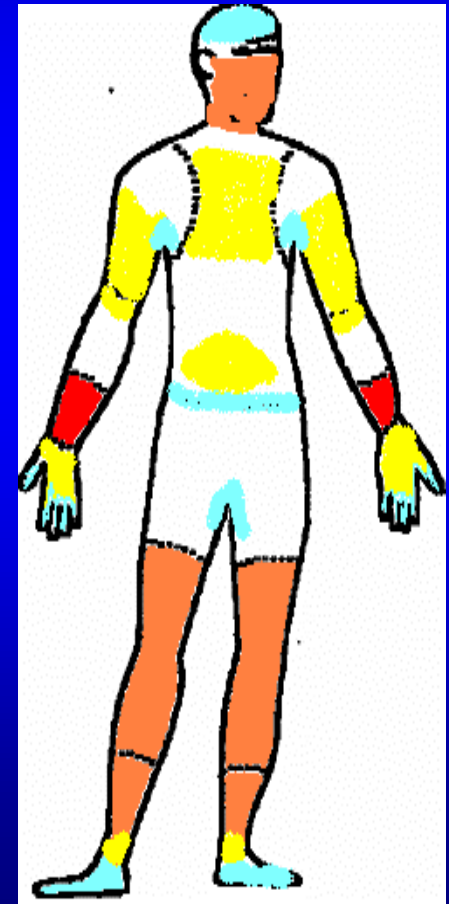
Please shade in **all** of the areas where you have had skin rashes/problems?



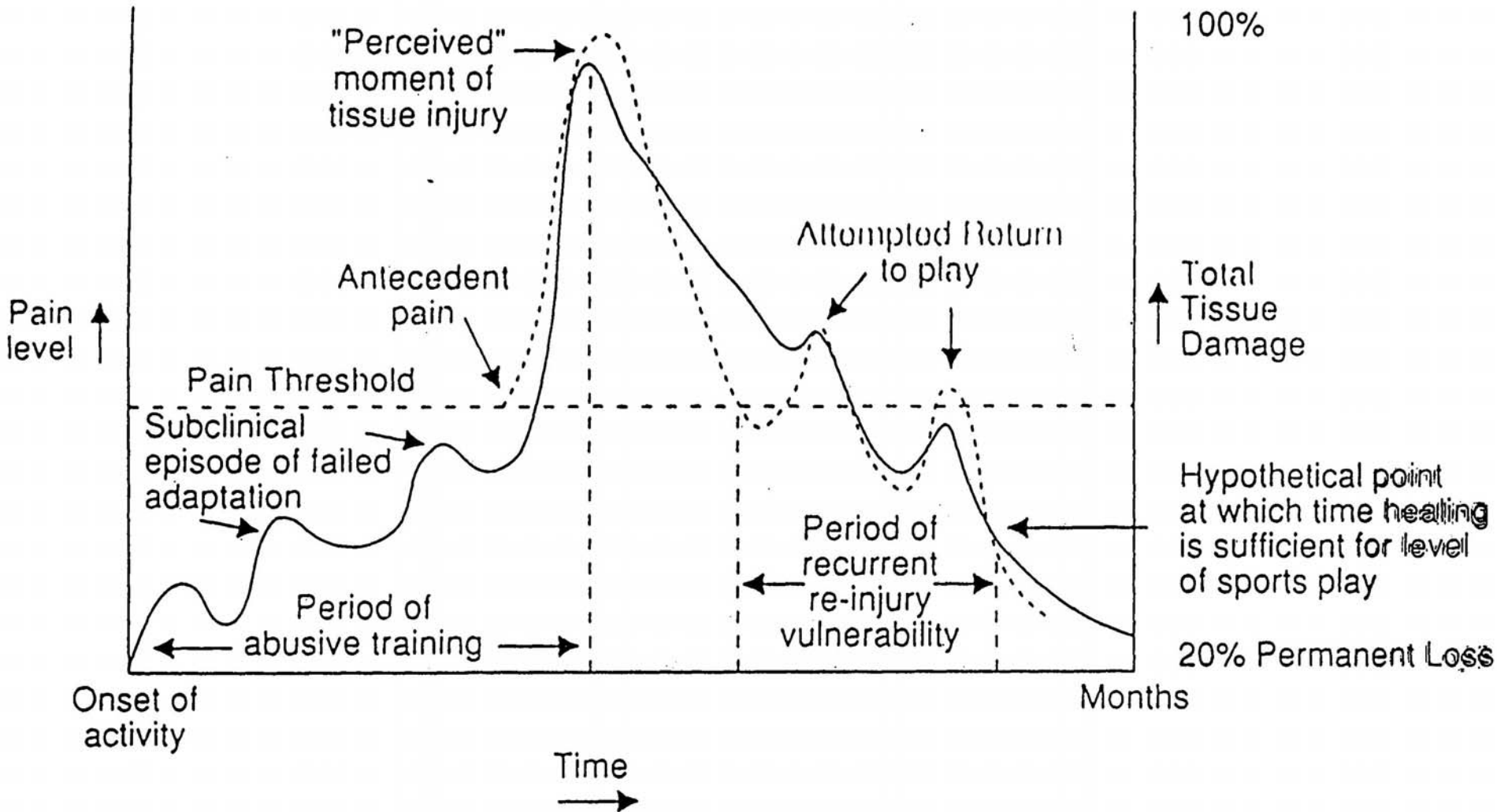
screening questionnaire

- Nordic skin symptom survey
- map results on body diagram

30-50%
20-30%
10- 20%
< 10%



RSI natural history:



Profile of chronic microtraumatic soft-tissue injury.

indicators of RSI

- people with splints, supports, etc.
- people rubbing sore body parts (wrists, hands, elbows, etc.)
- medication usage (pain killers)
- first aids, injuries, WSIB claims
- talk to people, survey



Ergonomic Questionnaire:

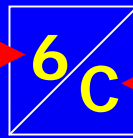
- To evaluate the ergonomic exposures and symptoms systematically we use a validated survey which includes the body map produced by Marley & Kumar:
 - “An Improved Musculoskeletal Discomfort Assessment Tool”, International Journal of Industrial Ergonomics, 17:21-27 (1996)



Discomfort scales:

0 no discomfort
1
2 fairly comfortable
3
4
5 moderate discomfort
6
7
8 very uncomfortable
9
10 extreme discomfort

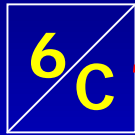
neck



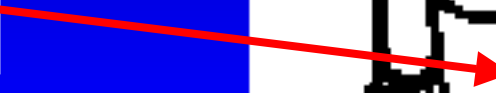
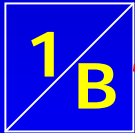
A = never
B = rarely
(few times/month)
C = frequently
(few times/week)
D = constantly
(nearly every day)



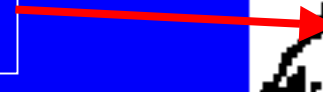
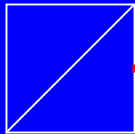
neck



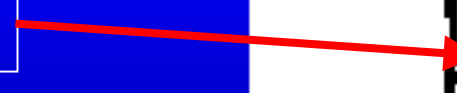
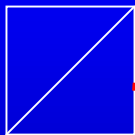
back



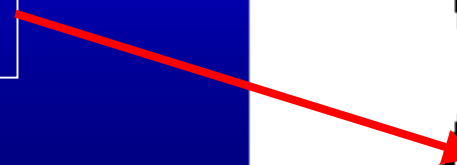
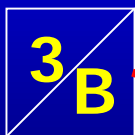
wrist



L. knee



L. foot



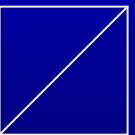
R. shoulder



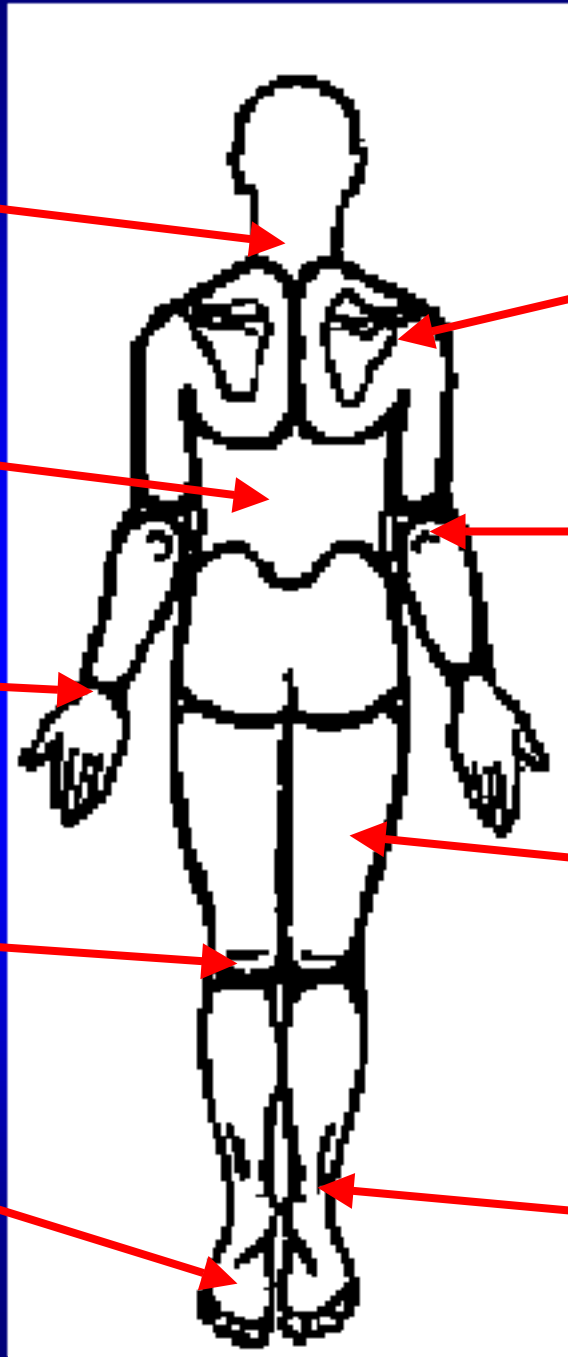
R. elbow



R. leg



ankle



Likelihood of seeking treatment:

legend

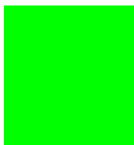
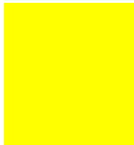

0	no discomfort
1	
2	fairly comfortable
3	
4	
5	moderate discomfort
6	
7	
8	very uncomfortable
9	
10	extreme discomfort





freq discmfrt	B = rarely	C = frequently	D = constantly
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



Likelihood of seeking treatment:

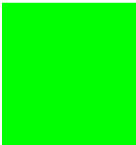

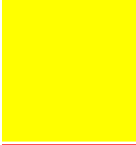



legend

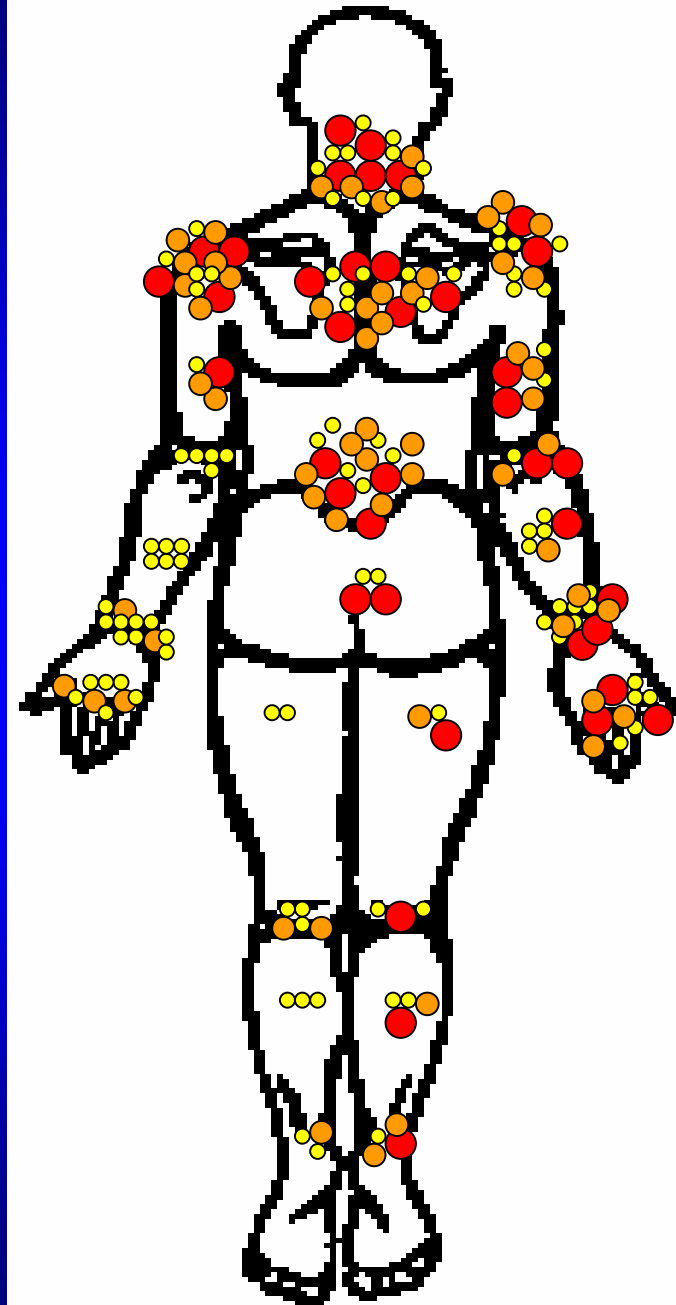
	not likely to seek treatment
	somewhat likely to seek treatment
	very likely to seek treatment

freq discmfrt	B = rarely	C = frequently	D = constantly
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

results from 27 support staff

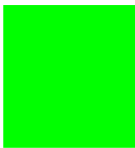

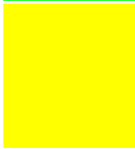



legend

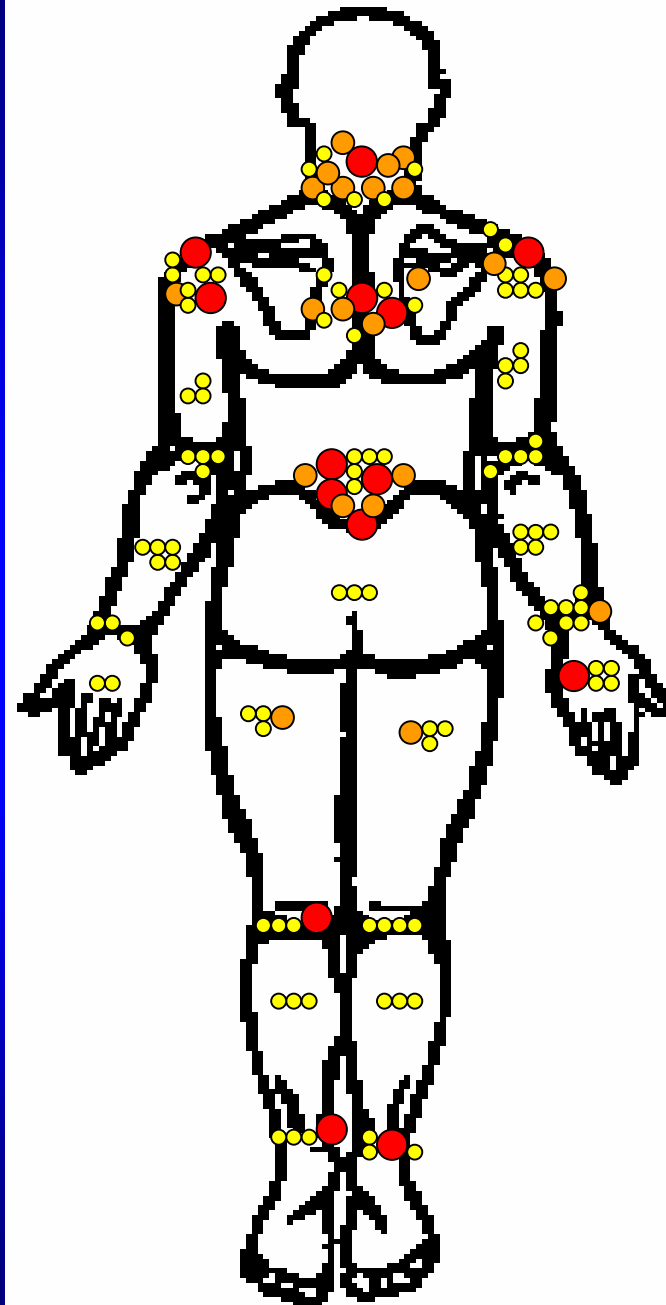
	not likely to seek treatment	
	somewhat likely to seek treatment	
	very likely to seek treatment	



results from 17 managers

legend

	not likely to seek treatment	
	somewhat likely to seek treatment	
	very likely to seek treatment	



Issues:

- understanding the natural history of disease
- medical confidentiality, respect
- “false” positives – labeling (quality of life issues)
- interpretation of survey results
- iatrogenic disease (internet)



What about Nick's 20 screening questions?

- not quite that simple but there is potential
- create simple screening tools for specific diseases
- address issues
- opportunity for partnership of OHCOW staff with workplace activists



... so, what can we do now?

- check for exposures (is there enough to cause disease?)
- focus on expected diseases (based on exposures)
- estimate risk based on exposures (based on this exposure how much disease can we expect?)
- understand the natural history of the disease (what are the early signs?)
- recognized a canary when you see one
- raise awareness
- talk to people and ask questions
- try some screening and see if it works?



let's keep talking ... !

