Screening

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Screening

“ application of a medical procedure or a test, *rapidly*, to people who as yet have *not* developed *symptoms* of disease for the purpose of determining their *likelihood of developing* of disease” .

Why screen

Purpose:

To reduce morbidity/mortality

by *detection at an early stage*

where treatment is more successful,

and cost effective

Assumption- "Favorable prognosis"

as treatment will start before clinical manifestation and arrest the process

Screening criteria

a disease need to satisfy:

- Life threatening,irreversible,serious
- Treatment at early stage to be more effective than one given after.
- High prevalence of detectable pre-clinical stage

Qualities of screening test

- ✓ **Low cost**
- ✓ **Easy to administer**
  - ➢ **skills**
  - ➢ **technique**
  - ➢ **minimal discomfort**
- ✓ ***Valid***
- ✓ **Reliable**
- ✓ **Reproducible**

Validity

"ability of a test to do what it is intended to do"

expressed as sum of-

Sensitivity+

Specificity+

Reliability(reproducibility)

Yield

Sensitivity

" A test's ability to designate an individual with a disease as positive", expressed as a/(a+c)

Highly ***sensitive***

- ***a few false negatives***
- ***fewer cases of disease missed***

	Disease		
Test	+ve	-ve	
+ve	a	b	a+b
-ve	c	d	c+d
	a+c	b+d	

Results depend on criteria of positivity

Specificity

"ability of a test to designate an individual who ***does not*** have a disease as ***negative,*** expressed as *d / b+d* ."

a highly specific test:

- a few false positives
- a fewer cases without disease are included

	Disease		
Test	+ve	-ve	
+ve	a	b	a+b
-ve	c	d	c+d
	a+c	b+d	

Changes in specificity/sensitivity…

? Ideal:

Sensitivity 100%

Specificity 100% (Increase in one at cost on other and depend on positivity criterion)

Less stringent- sensitivity increases

(more of actually diseased test +ve,

no. without disease also increase)

More strict - specificity increases

(large no. test –ve, more no. of true cases will be missed)

Conditions that ask for increase- - -

Increase Sensitivity-

- serious diseases
- a definite treatment exists
- subsequent diagnostic tests cost less

Increase Specificity-

- subsequent diagnosis costly, risky

Reliability

“ ability to reproduce same results with consistency ”

Factors:

Biological variations

Variation in method of testing

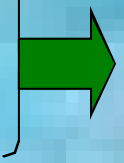
Intra-observer variation

Inter- observer variation

Evaluation of a screening test/program

Disease's appropriateness determined

Valid test available



Can a screening test be introduced ?

Feasibility ?

Effectiveness ?

Feasibility

- Acceptability
  - Quick
  - Easy to administer-Less discomfort
- Cost-effectiveness
  - Total cost
  - Unit cost
  - Follow-up cost
- Subsequent diagnosis & treatment of +ve
- Yield (no. detected)

  Measure- ***Predictive value***

Predictive value of a test

" a measure to ascertain whether or not a person tested positive, has the disease "

	Disease		
Test	Present	Absent	
+ve	900(a)	4950(b)	PV+ve
	(TP)	(FP)	(TP/TP+FP)=91%
-ve	100(c)	94050(d)	PV-ve
	(FN)	(TN)	(TN/FN+TN)=99.9%
Total	1000	99000	

Sensitivity-TP/TP+F=

Specificity-TN/FP+TN=

Predictive value - interpretations

Influencers- ***Validity***-increasing specificity, increases PV+ve test

Prevalence of pre-clinical disease

900	4950	5850	900	1980	2880
100	94050	94150	100	97020	97120
sens.-a/a+c=90%					90%
speci.-d/b+d=95%					98%
PV+ve-a/a+b=15.4%					31.3%
PV-ve- d/c+d=99.9%					99.9%

PV- interpretations...

Change in -prevalence	PV+ve	Sensitivity	Specificity
0.1	1.8	90	95
1.0	15.4	90	95
5.0	48.6	90	95
50.0	94.7	90	95

PV+ve can be increased by

-increasing specificity

-increasing prevalence

Effectiveness

Screening objective- To reduce morbidity/mortality through early detection & offering treatment in pre-clinical stage

To be effective-

-groups need to be comparable
-scrutinized for ascertainment of outcome
-bias reduced

Bias in screening

- Self-selection
- Time
- Lead time bias (identification during screening ----------diagnosis after symptoms
- Length bias- over representation of those with long pre-clinical phase, amongst screened (heterogeneous nature of disease, prevalence dependent on duration)