EMRIC +

“Risk Informed Decision Support in Public Health”

Dr. Chakib Kara-Zaïtri

Risk Informed Decision Support in Public Health

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Cross-border Infection and Environmental Hazards:
Challenges and Solutions
Maastricht, 29th November 2013

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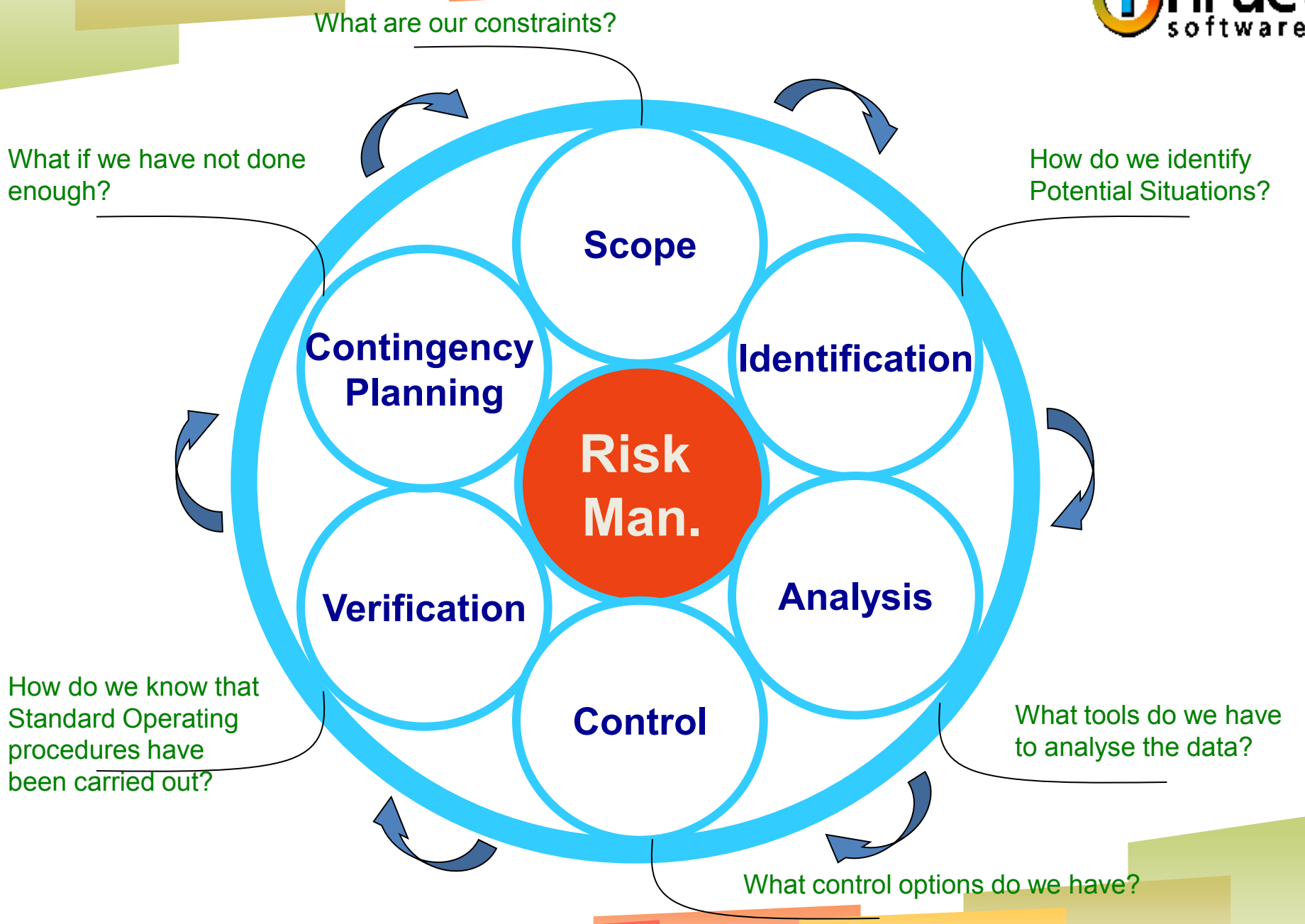
Agenda

- Risk Assessment in the Military
- Risk Assessment in Public Health
- Risk Assessment in Infectious Disease Control
- Cross-border Risk Assessment
- TB Risk Assessment
- Conclusions


RISK


What are our constraints?
What if we have not done enough?
How do we identify Potential Situations?
Scope
Contingency Planning
Identification
Risk Man.
Verification
Analysis
How do we know that Standard Operating procedures have been carried out?
Control
What tools do we have to analyse the data?
What control options do we have?

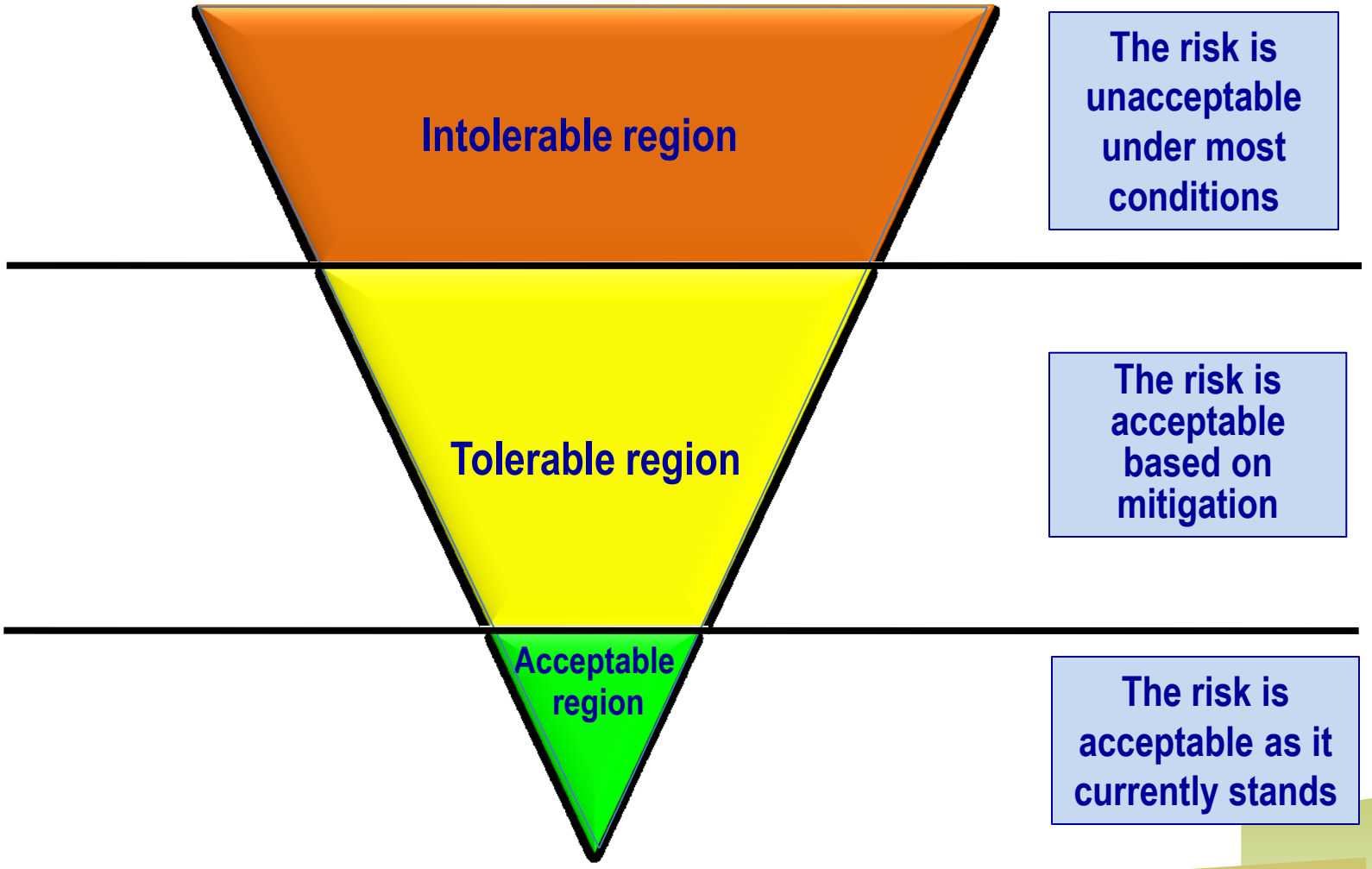
Mil-Std-882: Categories

Frequency		Hazard Category			
Qualitative	Quantitative	Catastrophic	Critical	Marginal	Negligible
Frequent	$> 10^{-1}$	1	3	7	13
Probable	10^{-1} to 10^{-2}	2	5	9	16
Occasional	10^{-2} to 10^{-3}	4	6	11	18
Remote	10^{-3} to 10^{-6}	8	10	14	19
Improbable	$>10^{-6}$	12	15	17	20

Def-Stan-00-56: Categories

Frequency		Hazard Category			
Qualitative	Quantitative	Catastrophic	Critical	Marginal	Negligible
Frequent	$> 10^{-2}$	A	A	A	B
Probable	10^{-2} to 10^{-4}	A	A	B	C
Occasional	10^{-4} to 10^{-6}	A	B	C	C
Remote	10^{-6} to 10^{-8}	B	C	C	D
Improbable	10^{-8} to 10^{-10}	C	C	D	D
Incredible	10^{-10} to 10^{-12}	C	D	D	D

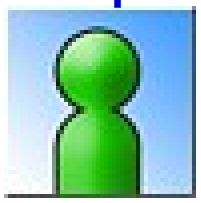
A.L.A.R.P


Intolerable region
Tolerable region
Acceptable region
The risk is unacceptable under most conditions
The risk is acceptable based on mitigation
The risk is acceptable as it currently stands

But we still struggle with Risk Assessment in Public Health …

- This is mainly due to risk criteria being:
  - difficult to define
  - difficult to weigh
  - complex and multidisciplinary (medical, social, political and cultural dimensions),
  - difficult to measure due lack of appropriate data

People



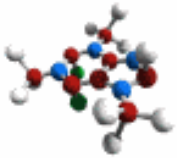
Knowledge Management

Cases

Risk Assessment

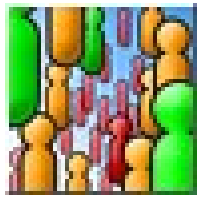
Actions

Lab Results

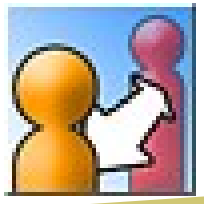


Events

Situations



Contacts

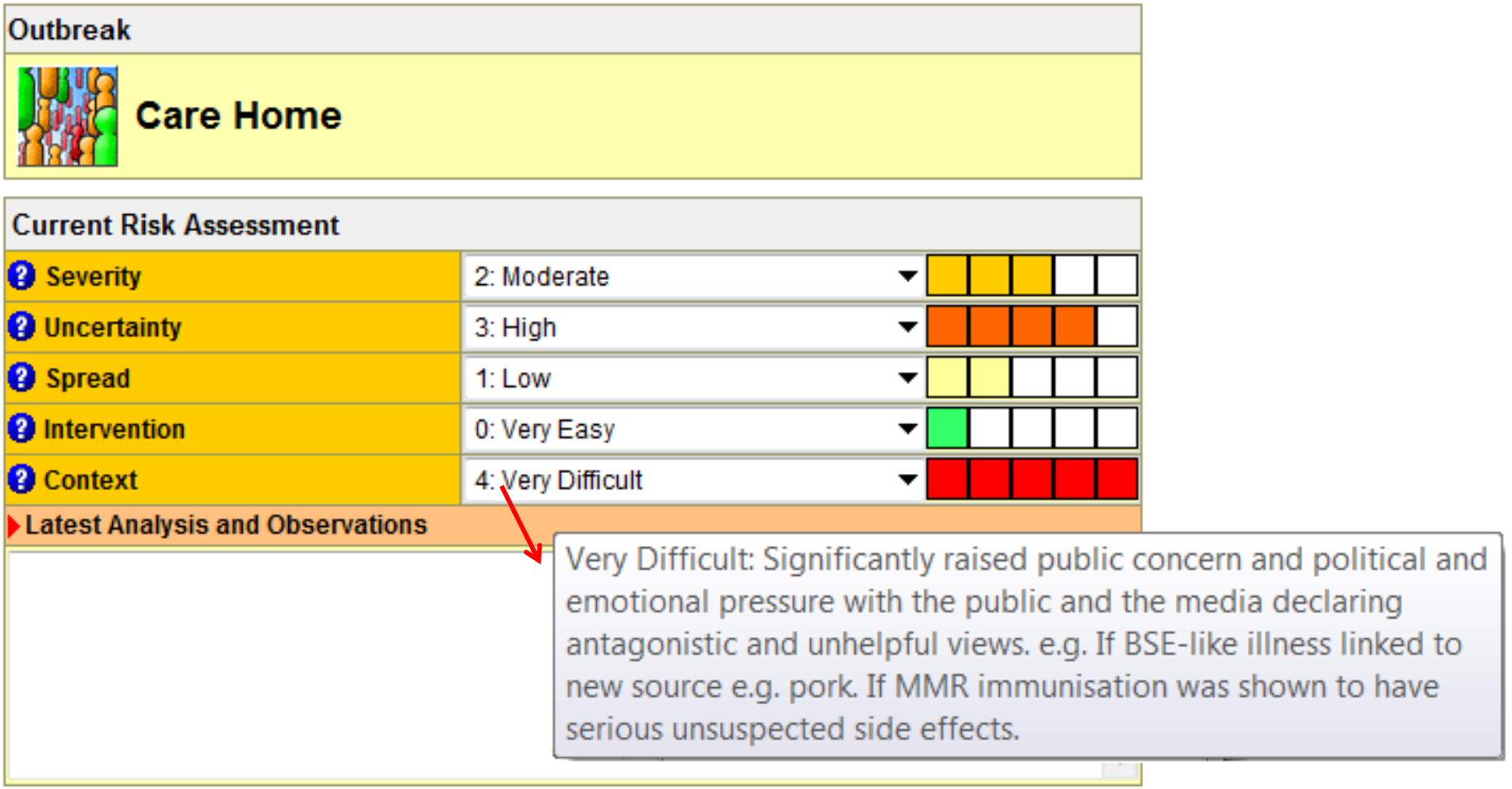


The reality is …

- Many new diseases have emerged in the past decades.
- Pandemics are travelling faster and wider than ever before owing to global travel and trade.
- “Old” diseases such as malaria and TB, are now re-emerging in forms resistant to drug treatments.

So Why Risk Assessment in Pubic Health?

Risk Assessment Model for Infectious Disease Control



Severity

- The seriousness of the incident in terms of the intrinsic propensity in the specific circumstances to cause harm to individuals or to the population.

Grade	Qualifier	Description
0	*Very Low*	Seldom causing severe illness.
1	*Low*	Occasional serious illness rarely with long term effects or death.
2	*Moderate*	Often severe illness occasionally with long term effects or death.
3	*High*	Usually severe illness often with long term effects or death.
4	*Very High*	Severe illness almost invariably fatal.

Uncertainty

- The level of uncertainty, epidemiologically, clinically, statistically and from laboratory evidence, that the diagnosis is correct in the set of circumstances..

Grade	Qualifier	Description
0	*Very Low*	Available evidence suggests that the hypothesis is correct with an empirical probability higher than 85%.
1	*Low*	Available evidence suggests that the hypothesis is correct with an empirical probability in the range of 50% to 85%.
2	*Moderate*	Available evidence suggests that the hypothesis is correct with an empirical probability in the range of 25% to 50%.
3	*High*	Available evidence suggests that the hypothesis is correct with an empirical probability in the range of 10% to 25%.
4	*Very High*	Available evidence suggests that the hypothesis is correct with an empirical probability of less than 10%.

Spread

- The intrinsic temporal and spatial potential for spread including the infective dose, the virulence of the organism, the availability of the route(s) of spread, the observed spread and the susceptibility of the population (e.g. lack of immunity) in the set of circumstances.

Grade	Qualifier	Description
0	*Very Low*	Very low likelihood of spread with very few new cases.
1	*Low*	Low likelihood of spread with few new cases.
2	*Moderate*	Moderate likelihood of spread with new cases. May develop into a limited outbreak.
3	*High*	High likelihood of spread with many new cases. May develop into a large outbreak.
4	*Very High*	Spread almost inevitable.

Intervention

- The feasibility to intervene to alter the course and influence the outcome of the event in terms of containing, reducing or eliminating the transmission of the organism, or assuaging public anxiety.

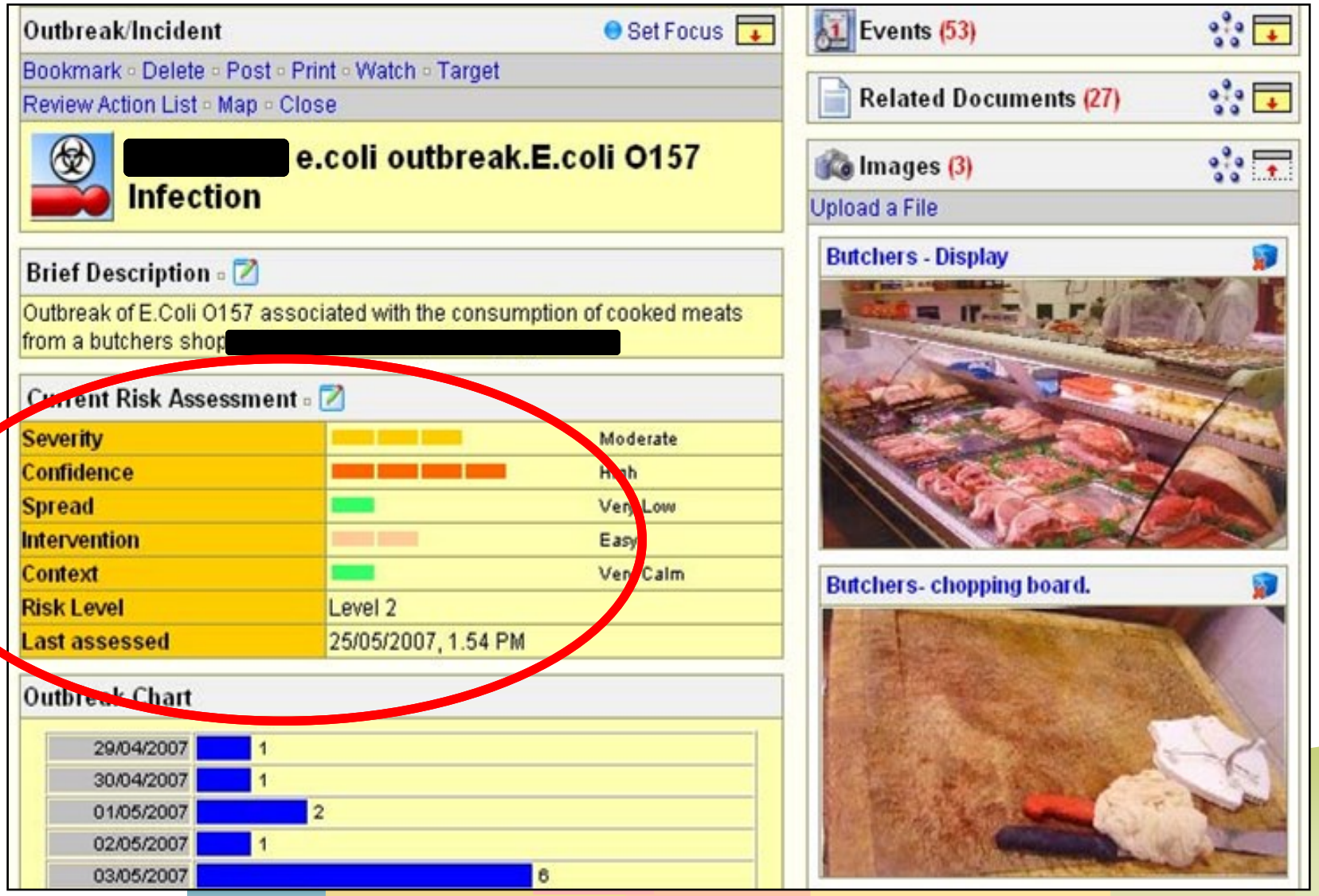
Grade	Qualifier	Description
0	*Very Easy*	Intervention well established with clear benefits and no anticipated difficulties to implement.
1	*Easy*	Intervention with clear beneficial effects and few difficulties to implement.
2	*Passable*	Intervention with some beneficial effects and some difficulties to implement.
3	*Difficult*	Some remedial intervention possible but either difficult to implement, relatively ineffectual or other significant problems.
4	*Very Difficult*	Remedial intervention very difficult.

Context

- The broad environment, including public concern and attitudes, expectations, pressures, strength of professional knowledge and the overall setting of external factors including politics, in which events are occurring and decisions on responses are being made.

Grade	Qualifier	Description
0	*Very Calm*	No raised level of interest.
1	*Calm*	A small degree of increased interest with a low level of conflicting factors. Little public concern.
2	*Passable*	A degree of unease and anxiety on the part of the public and the media. The context could deteriorate if the event is mis-handled.
3	*Difficult*	Context is sensitive with significant difficulties, press interest and local people (unaffected) involved. The incident could go very wrong unless carefully handled. The event could have re-occurred in spite of preventive actions.
4	*Very Difficult*	Significantly raised public concern and political and emotional pressure with the public and the media declaring antagonistic and unhelpful views.

How the risk assessment is used in practice



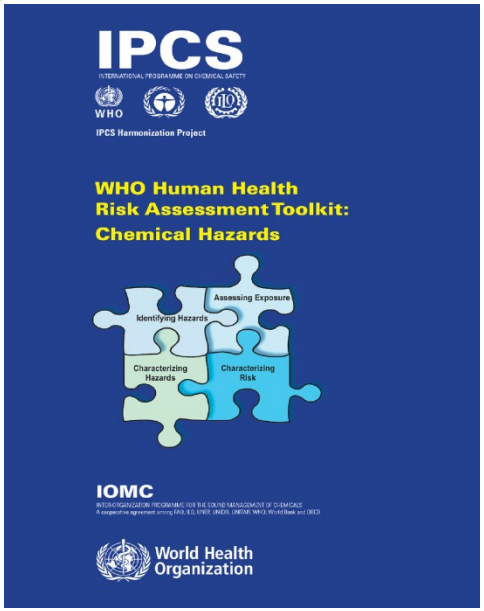
Decision on serious cross-border threats to health (22nd October 2013)

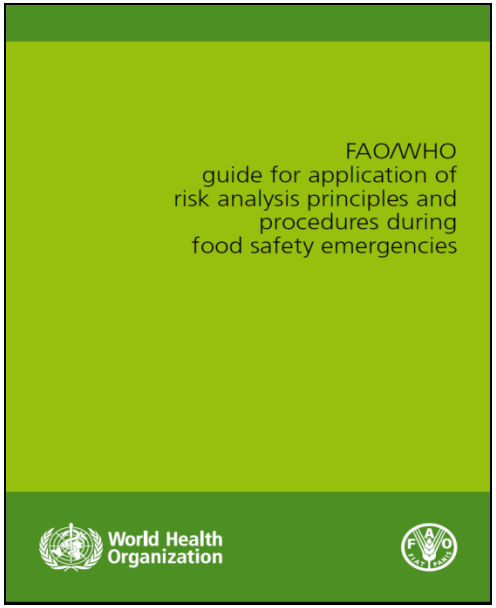
1. Strengthen preparedness planning
2. Improve risk assessment and management of cross-border health threats
3. Establish the necessary arrangements for the development and implementation of a joint procurement of medical countermeasures
4. Enhance the coordination of response at EU level by providing a solid legal mandate to the Health Security Committee

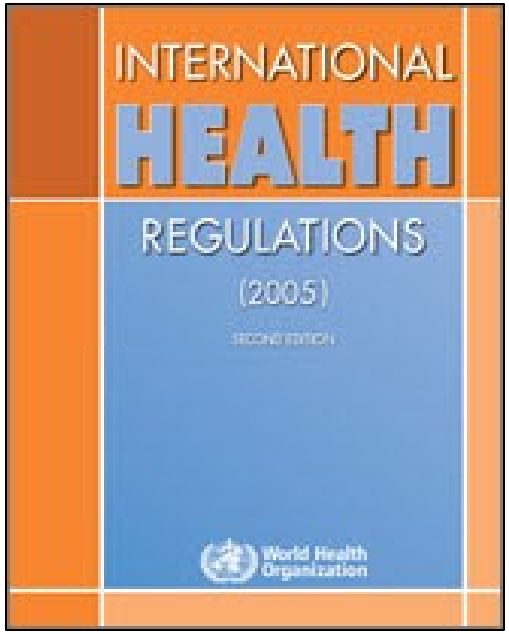
Types of Serious Cross-border Health Threats

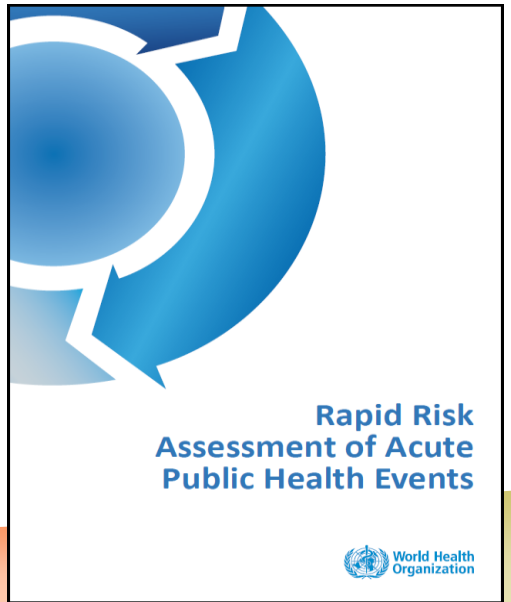
- **Chemical**: acute release of dangerous substances
- **Biological**: diseases and bio-toxins
- **Radiological/Nuclear**: emergencies of international concern
- **Environmental**: extreme weather conditions
- Threats of unknown origin

Many Important Publications









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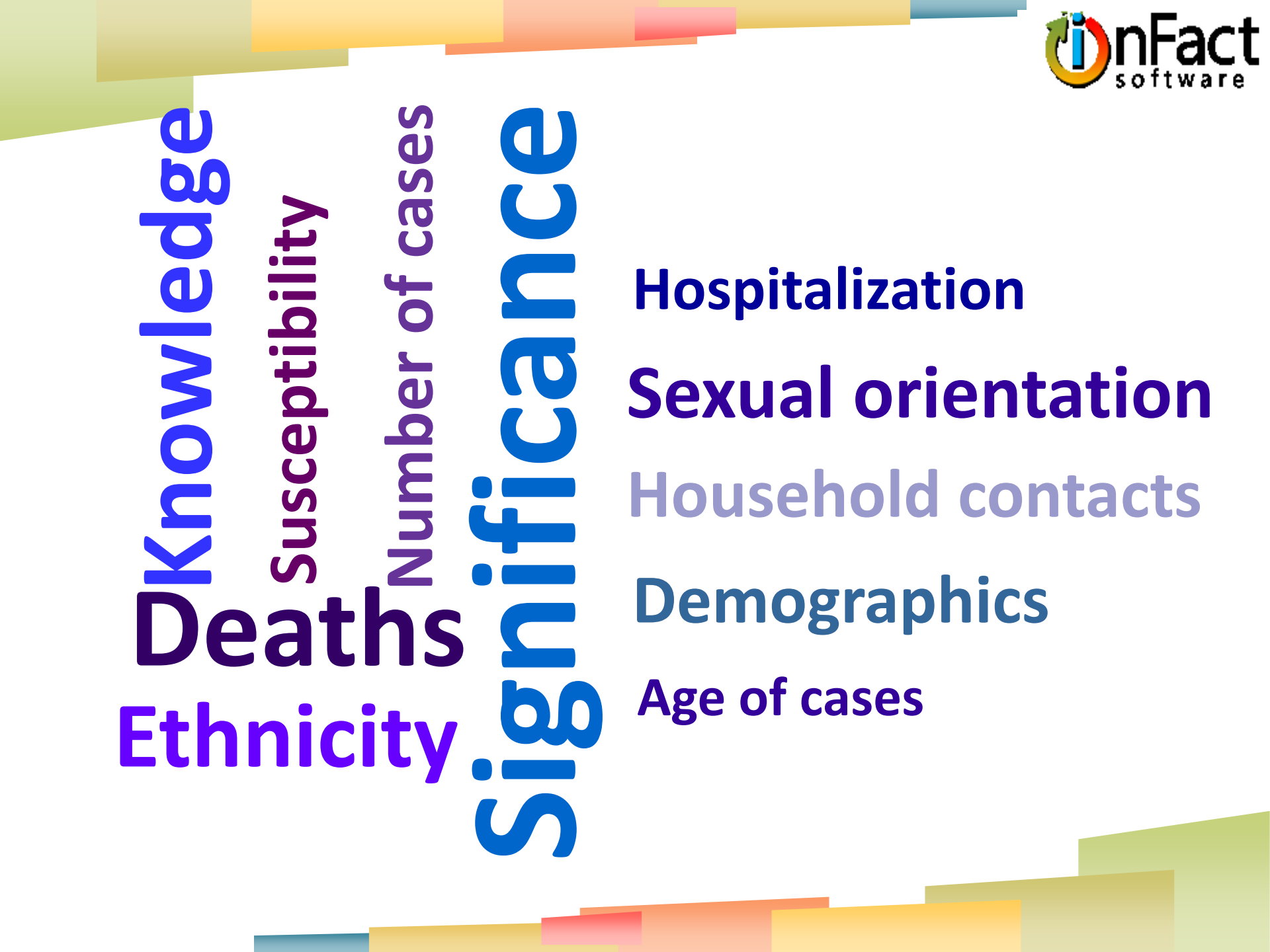
Cross-border Risk Assessment attributes: Brainstorm Results

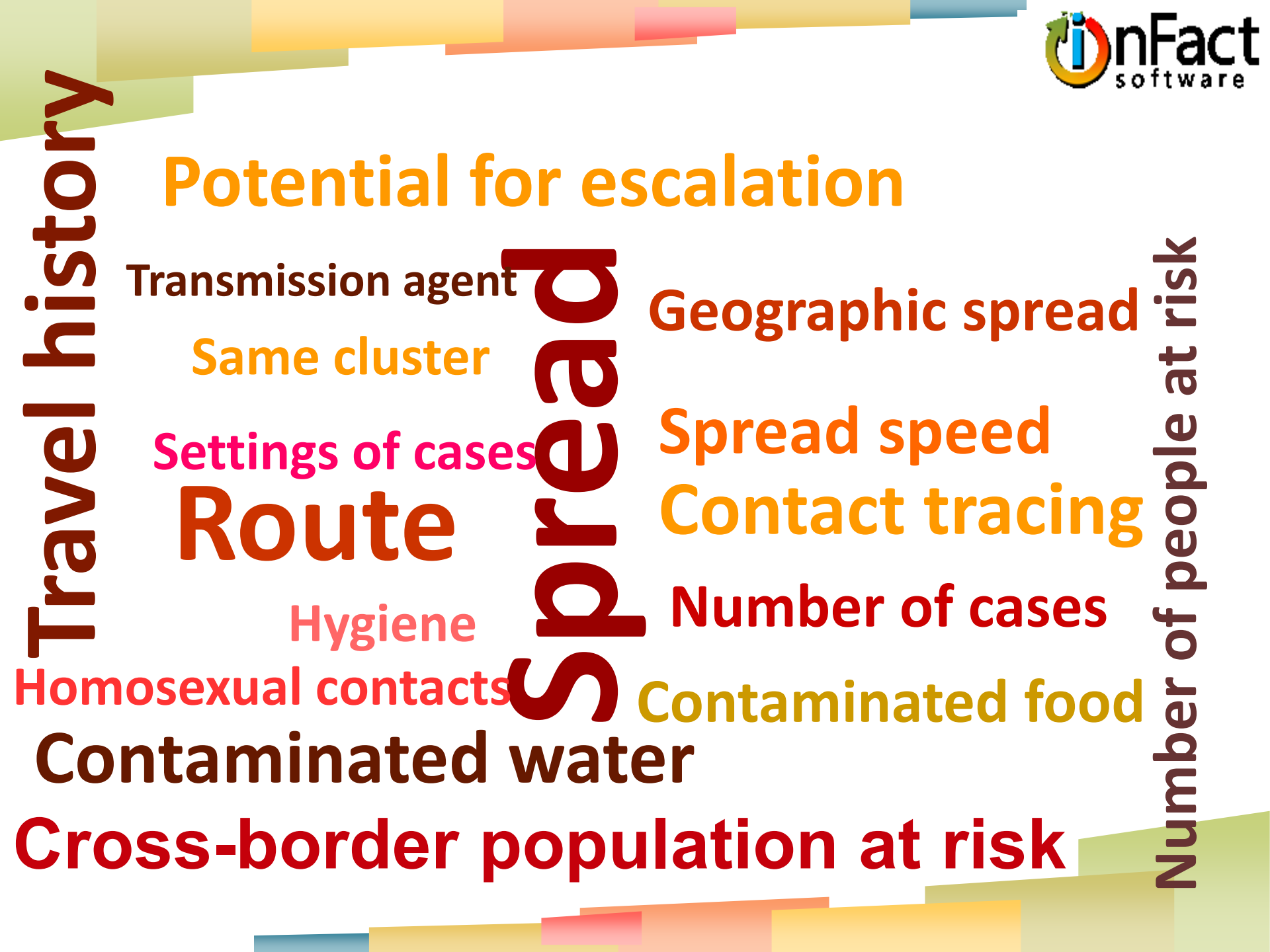
Significance

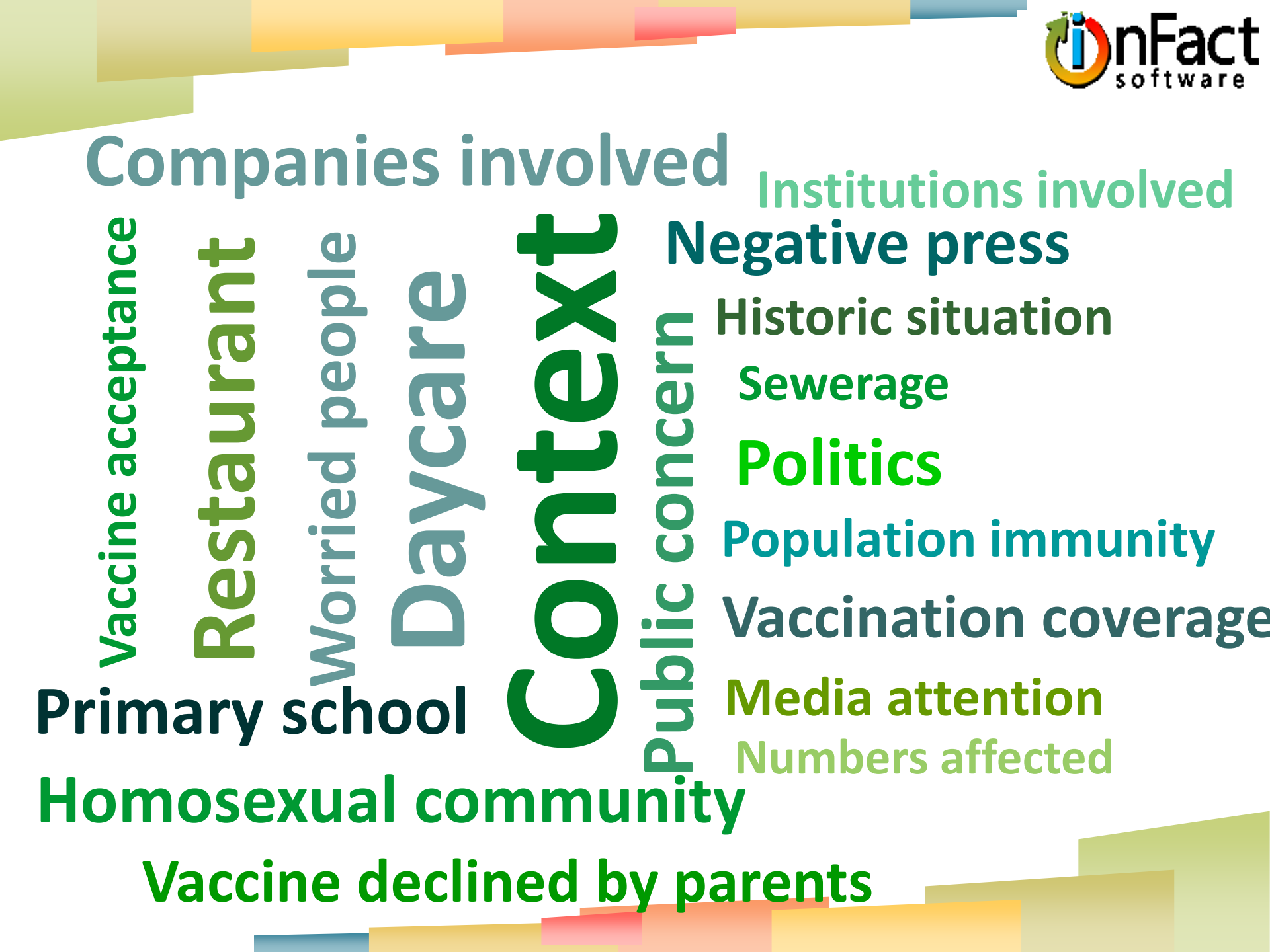
Spread

Context

Response


Knowledge
Susceptibility
Number of cases
Deaths
Ethnicity
Significance
Hospitalization
Sexual orientation
Household contacts
Demographics
Age of cases

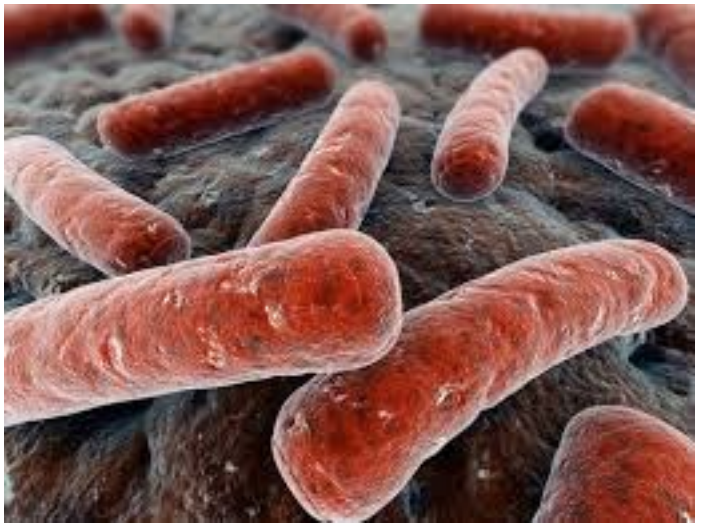

Potential for escalation
Transmission agent
Same cluster
Settings of cases
Route
Hygiene
Homosexual contacts
Contaminated water
Cross-border population at risk
Spread
Geographic spread
Spread speed
Contact tracing
Number of cases
Contaminated food
Travel history
Number of people at risk


Companies involved
Institutions involved
Vaccine acceptance
Restaurant
Worried people
Daycare
Context
Public concern
Negative press
Historic situation
Sewerage
Politics
Population immunity
Vaccination coverage
Media attention
Numbers affected
Primary school
Homosexual community
Vaccine declined by parents

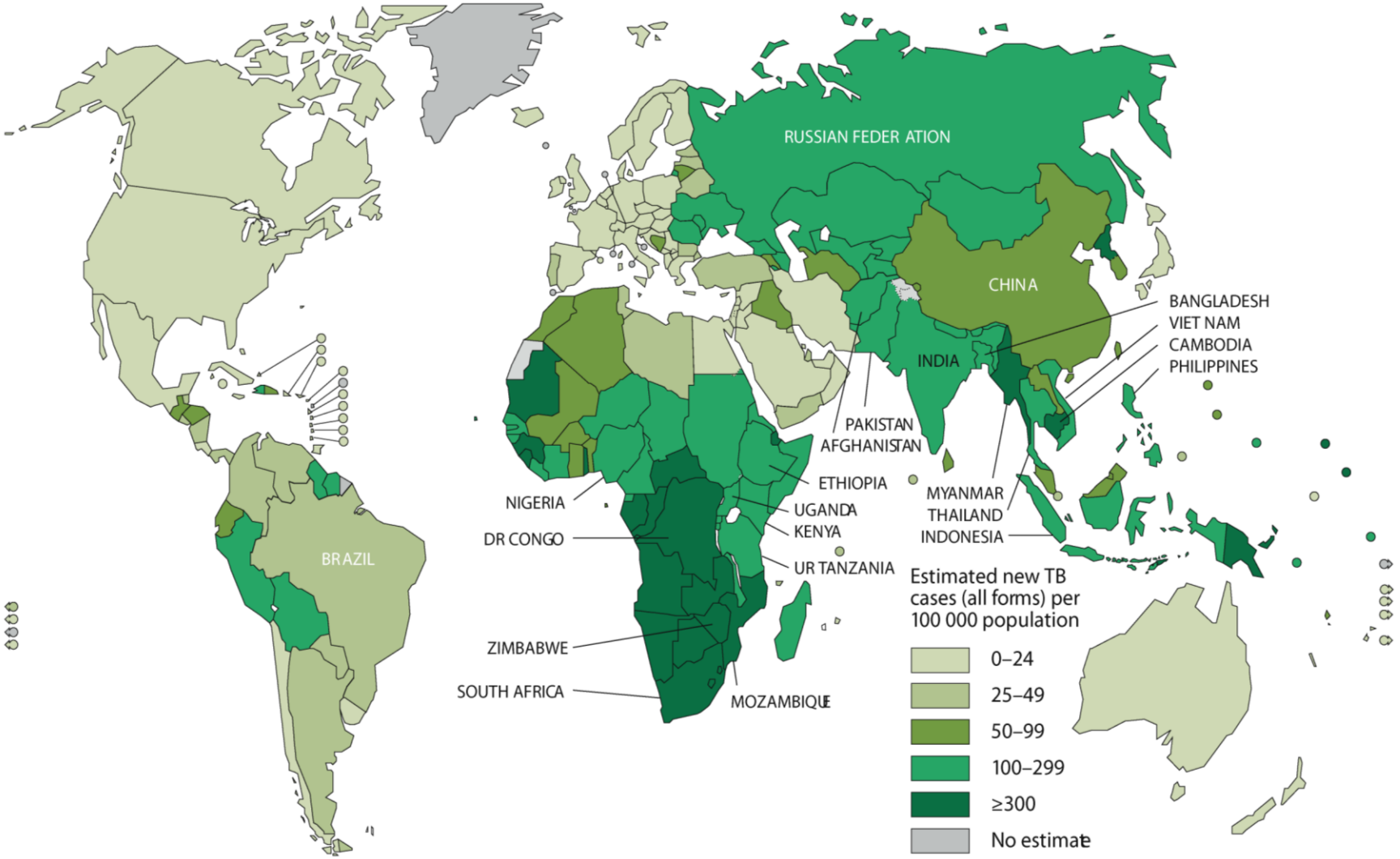

Cross-border notification
Questionnaire
Resources available
Investigate source
Communication
Outbreak
Inform contacts
investigation team
Vaccination
Inform GPs and media
Response
Public information
Stop source of infection
Inform municipality (politics)

The burden of TB around the world

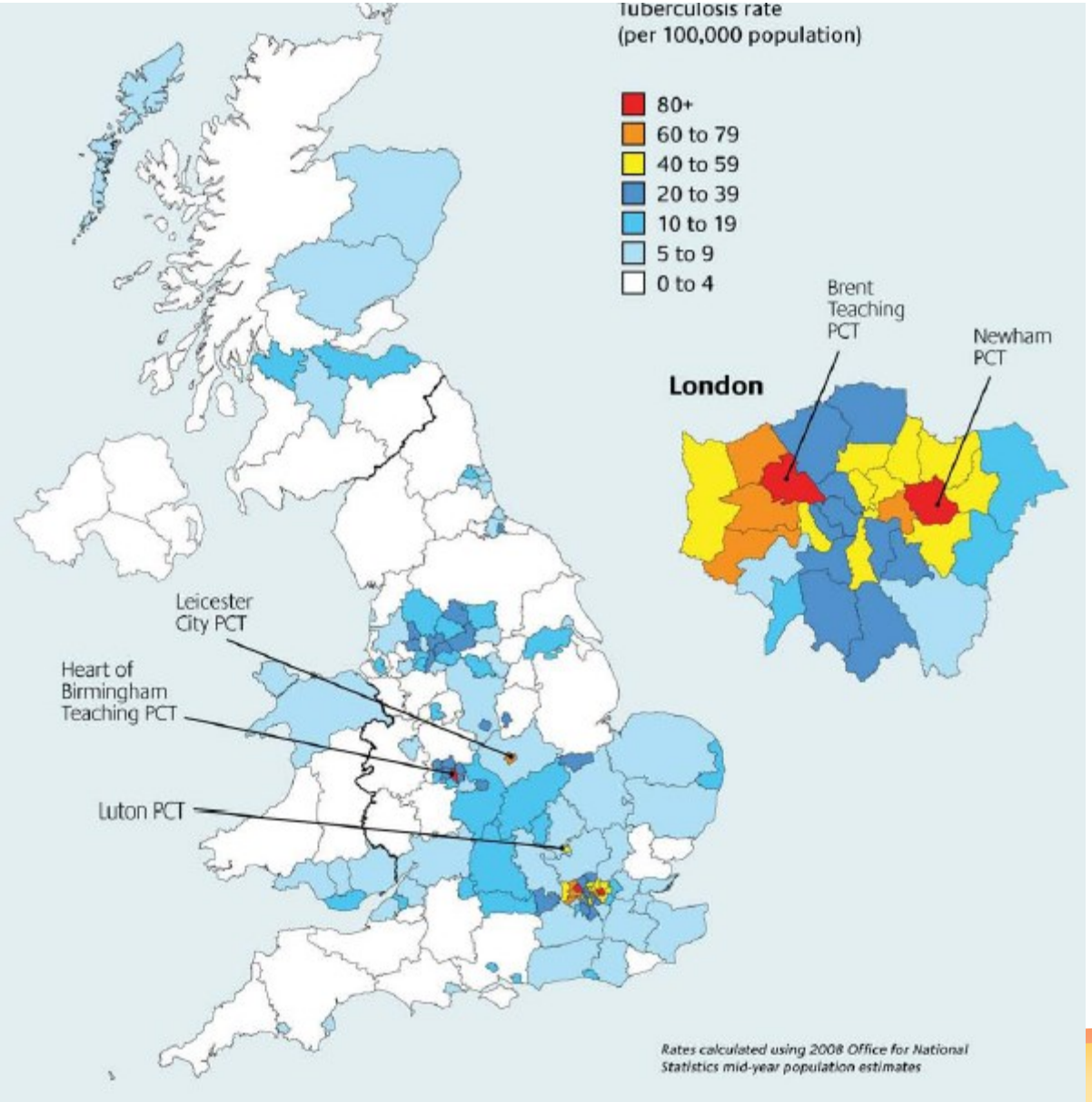
- An average of one new infection per second
- Two million people died from tuberculosis in 2010, 1 every 20 seconds
- TB is the leading killer of those with HIV
- TB is the 2nd leading killer from an infectious disease

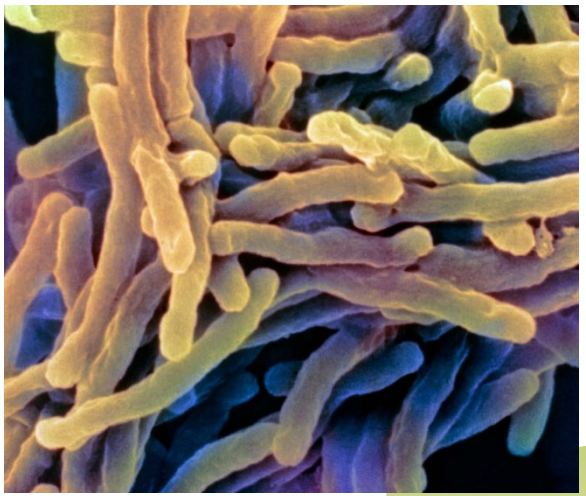


Global TB Incidence Rates in 2010



TB Risk Assessment Model





Current TB Issues in the UK

- Poor quality of data
- Delays in diagnosis
- Difficult patient follow-up
- Variable Directly Observed Treatment Service (DOTS)
- Language and cultural barriers
- Contact tracing
- Volume of work
- Time pressure on clinical staff
- Variability of practise

Aim of TB Risk Assessment Model

- To enable TB health professionals prioritise and target management intervention by assessing the patients' likely progress to becoming non-infectious and regaining good health.

Treatment

Management

Spread

Confidence

Confidence

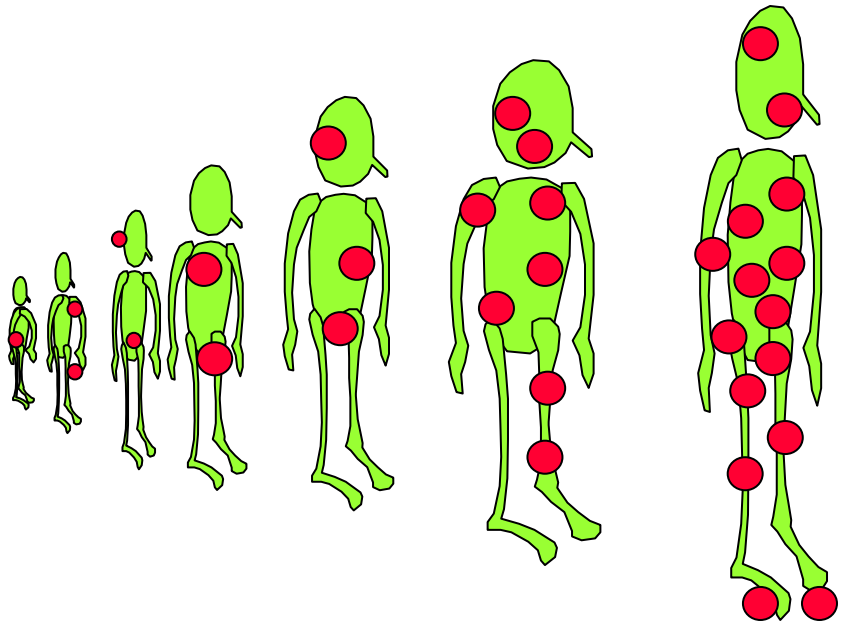
The level of confidence, epidemiologically, clinically, statistically and from laboratory evidence, that the diagnosis (including resistance profile) and site of disease are correct in the set of circumstances, taking into account place of birth, age, previous history of tuberculosis and membership of risk groups.

Confidence Ratings

Rating	Qualifier	Example
1	Suspected	Patient with symptoms such as cough, fever, weight loss, night sweats, and positive mantoux.
2	Possible	Suspected patient with X-ray cavitation.
3	Probable	Possible patient who is AFB positive, histology and / or culture positive.
4	Confirmed	Patient with positive sputum and mycobacterium TB confirmed by DNA typing.

Spread

The intrinsic temporal and spatial potential for spread including the degree of contact, the length of the period of contagiousness, the availability of the route(s) of spread, the observed spread and the susceptibility of contacts in the set of circumstances.



Spread Ratings

Rating	Qualifier	Example
1	Low	Hermit with non pulmonary TB
2	Moderate	Patient culture positive and living alone or with small family, non pulmonary TB.
3	High	Large family with some patients with sputum strongly positive.
4	Very High	Patient with sputum strongly positive and working in a hospital.

Management

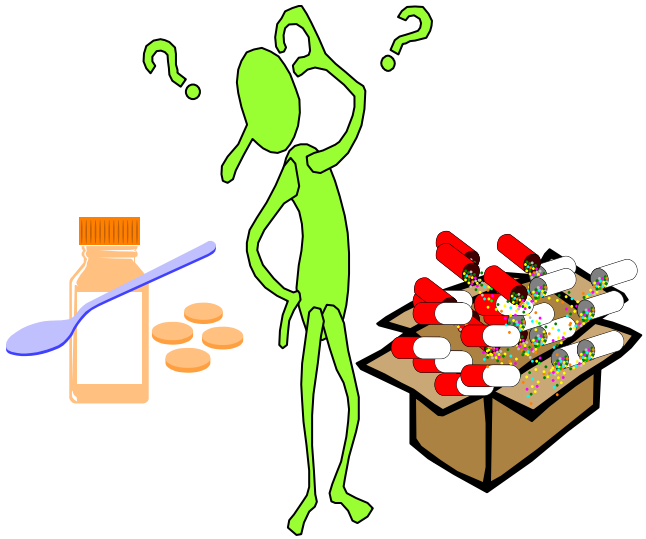
- The ability of the patient and associated contacts to benefit from TB health services in respect of simple, effective, available, acceptable, accessible and timely management interventions, taking into consideration the level of motivation to attend appointments, the quality and preponderance of communication from the patient, and transport and languages challenges in the set of circumstances.

Management Ratings

Rating	Qualifier	Example
1	Routine	Patient taking standard treatment and fully compliant with advice and treatment.
2	Challenging	Patient does not speak English. Patient does not attend some clinical appointments. Patient may not be fully compliant with advice and may not be taking treatment regularly.
3	Difficult	Patient does not attend multiple clinic appointments. Patient rings with problems regularly. Patient ignoring advice. Checks on compliance indicate missed doses.
4	Problematic	Patient absconding or lost to follow-up

Treatment

- The ability to intervene to benefit the patient and associated contacts from anti-TB therapy using standard drugs with little or no side effects, combined with a high motivation of the patient and associated contacts to accept and receive treatment in the set of circumstances.

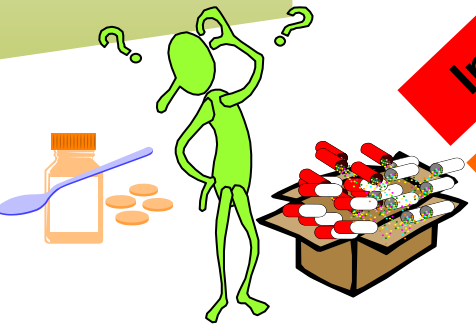


Treatment Ratings

Rating	Qualifier	Example
1	Routine	Standard treatment effective arranged shortly after diagnosis with no side effects.
2	Challenging	TB is resistant against standard treatment or significant side effects of treatment.
3	Complicated	MDR – multi drug resistant.
4	Impossible	XDR – extensive drug resistant, CDR – completely drug resistant

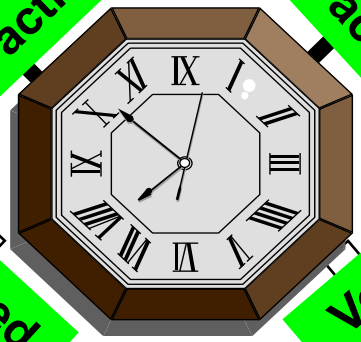
Treatment

Impossible
Complicated
Challenging
Routine
No action

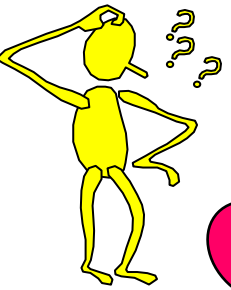


Management

Problematic
Difficult
Challenging
Routine
No action

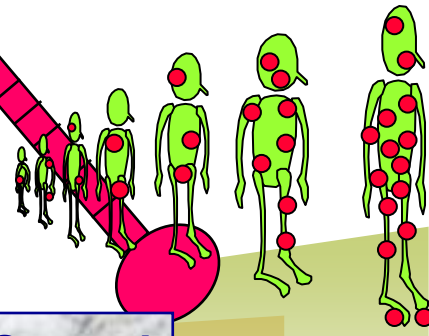


Discarded
Suspected
Possible
Probable
Confirmed



Confidence

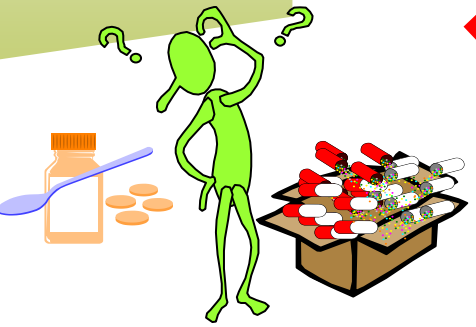
Very low
Low
Moderate
High
Very High

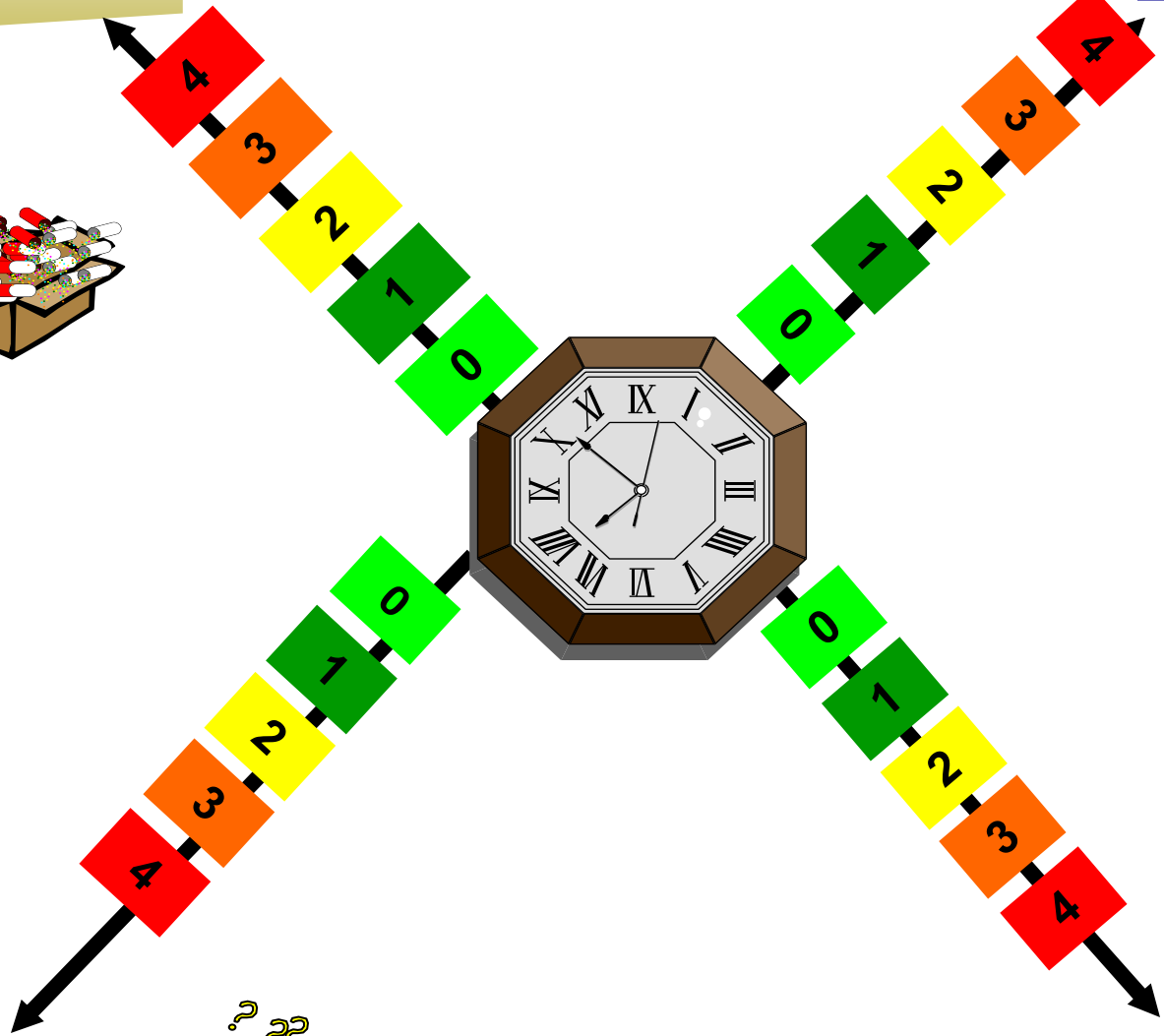


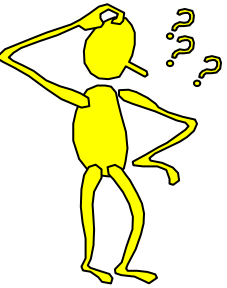
Spread

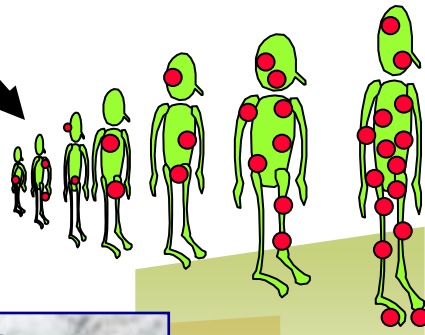
Treatment

Management





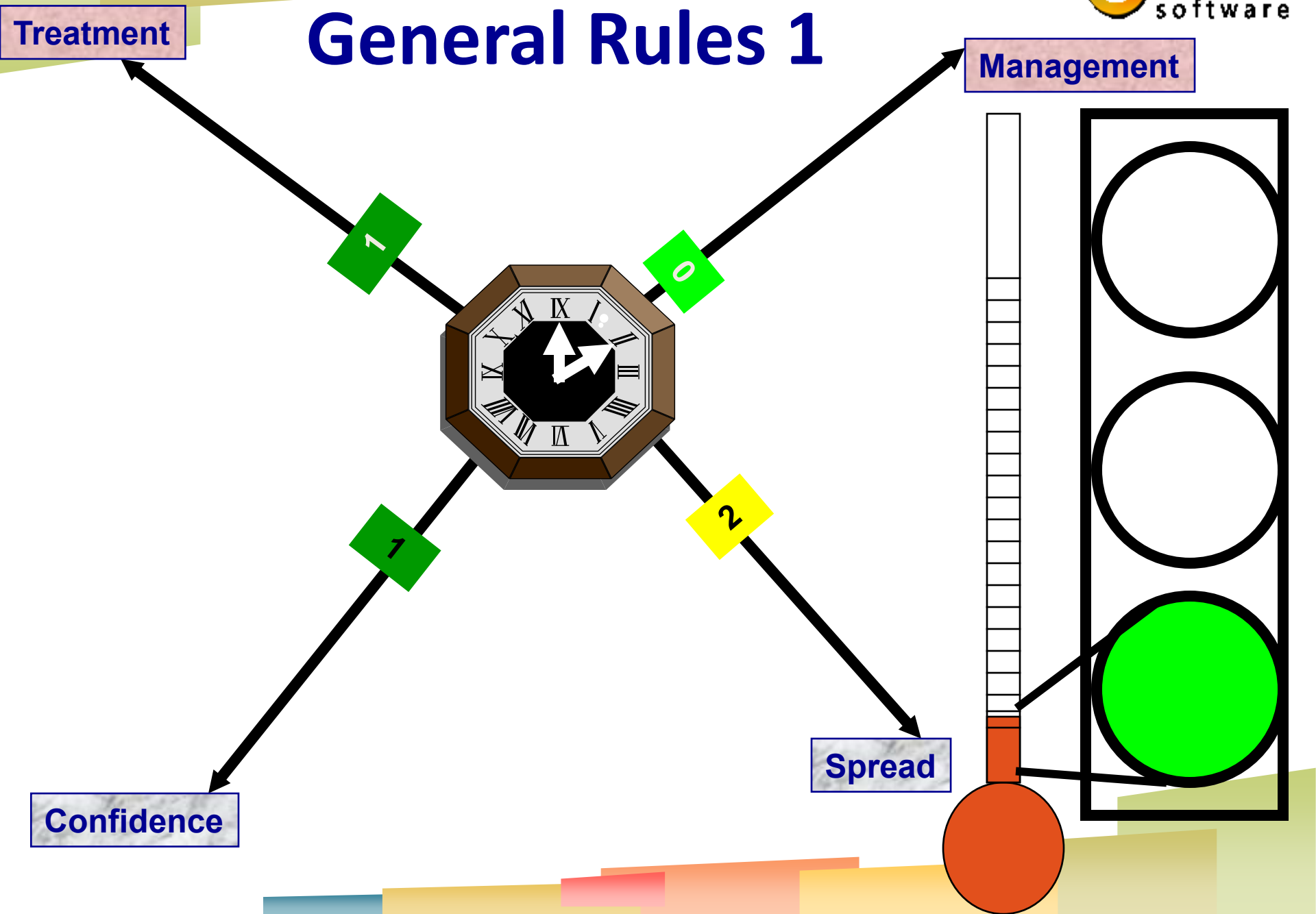




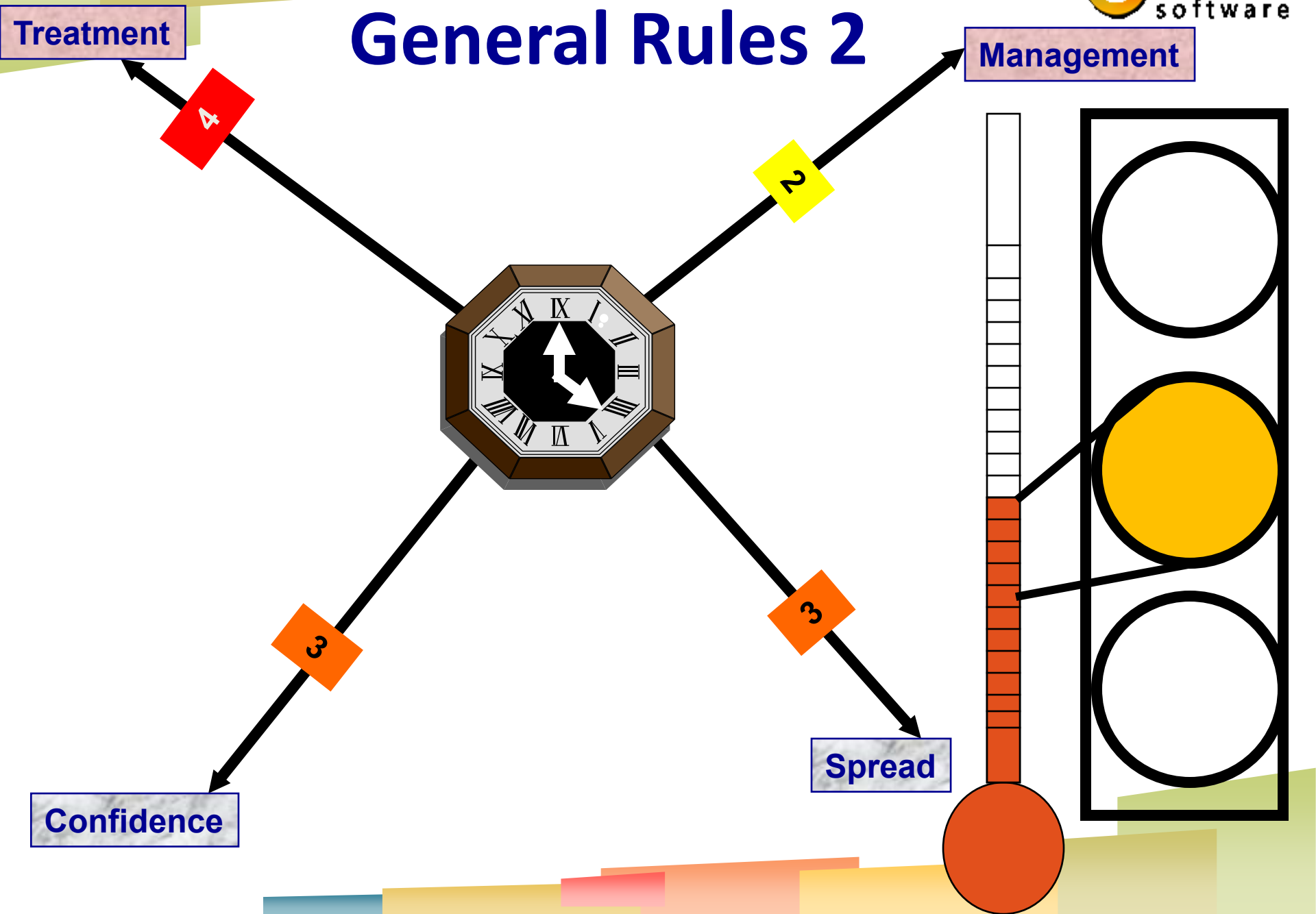
Confidence

Spread

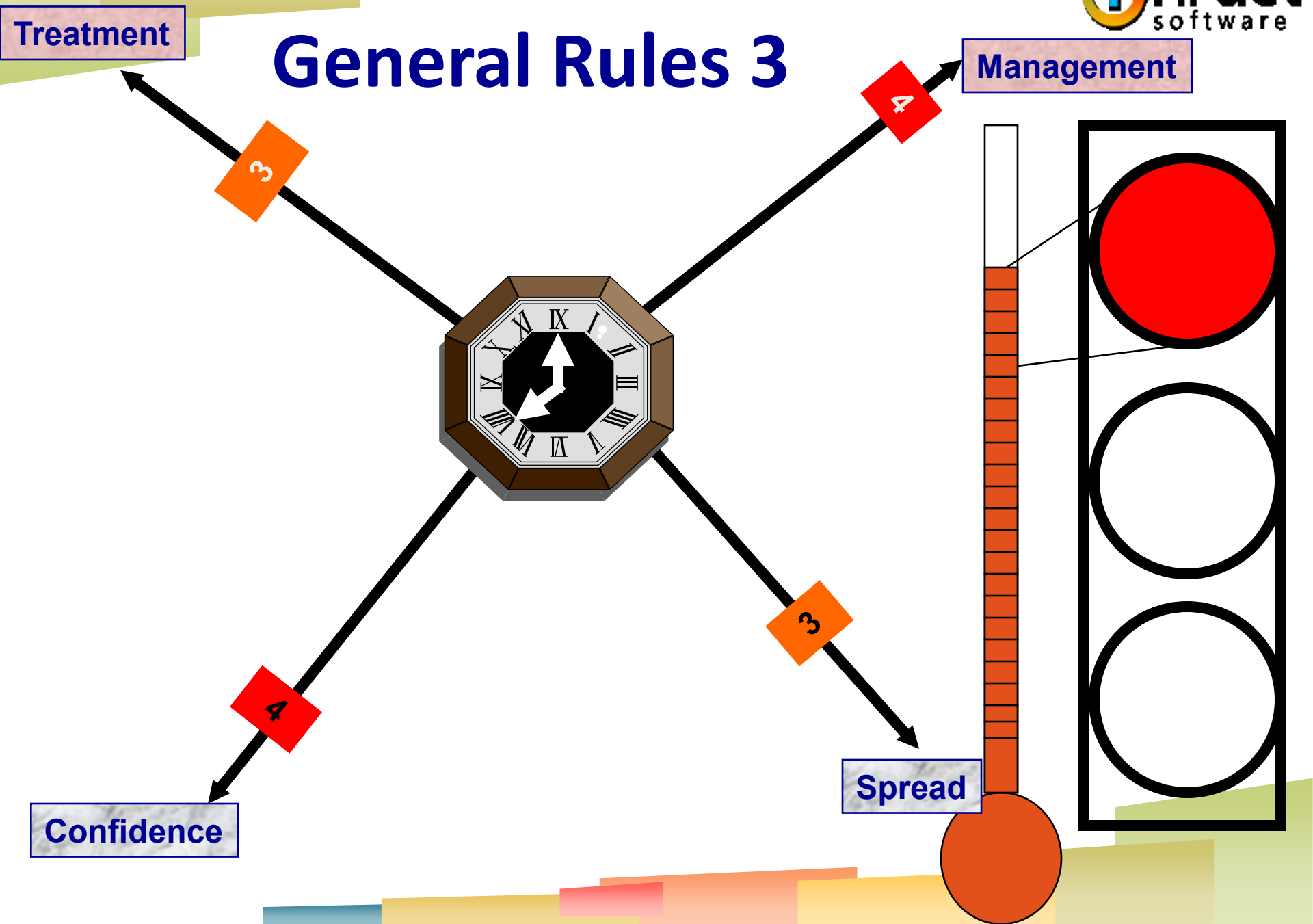
General Rules 1



General Rules 2



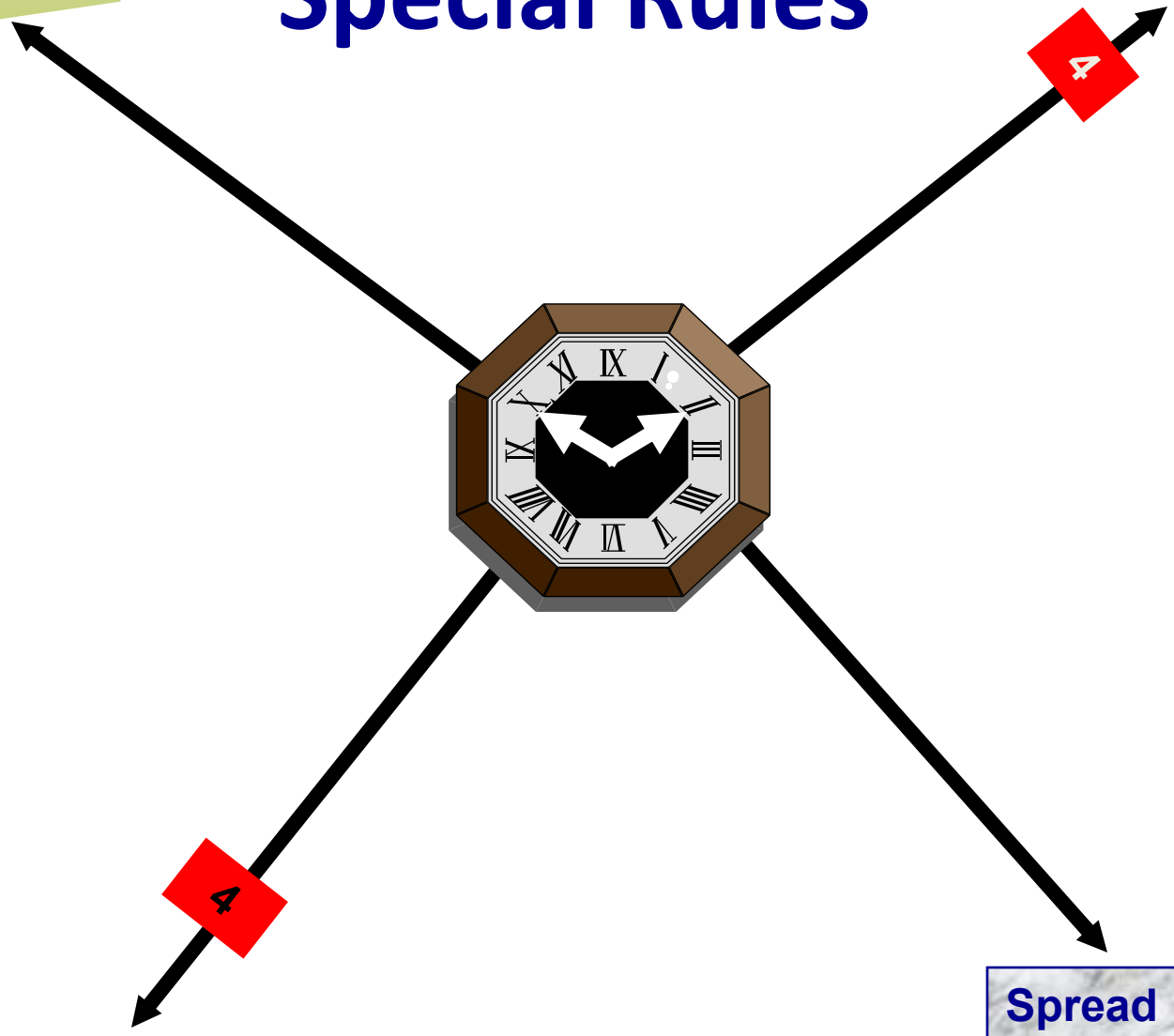
General Rules 3

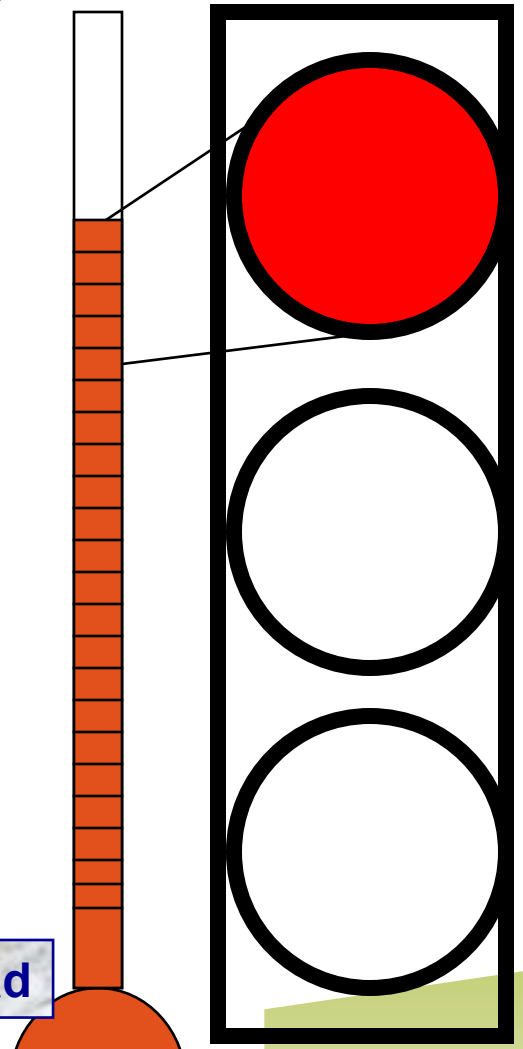


Treatment

Management

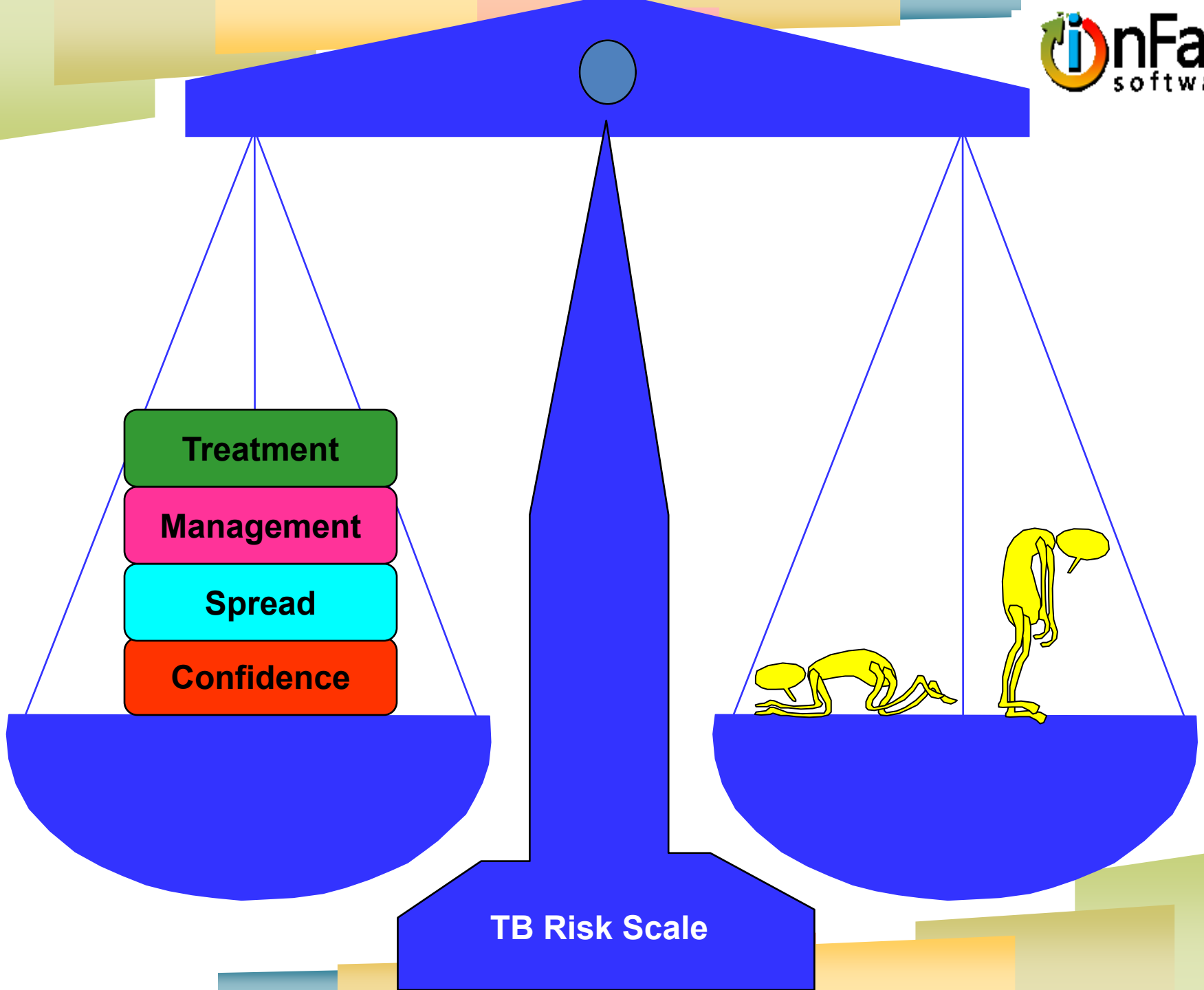
Special Rules

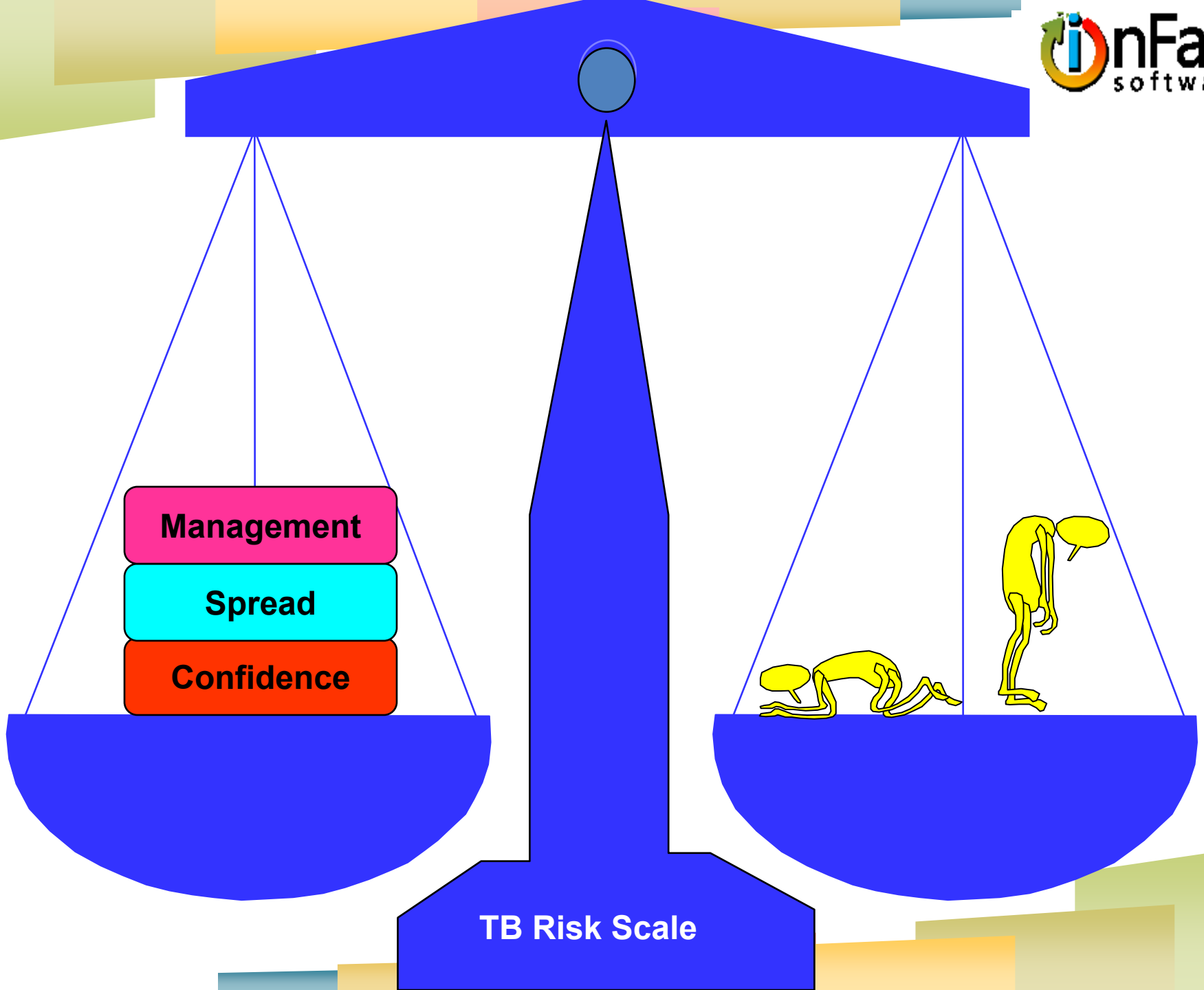


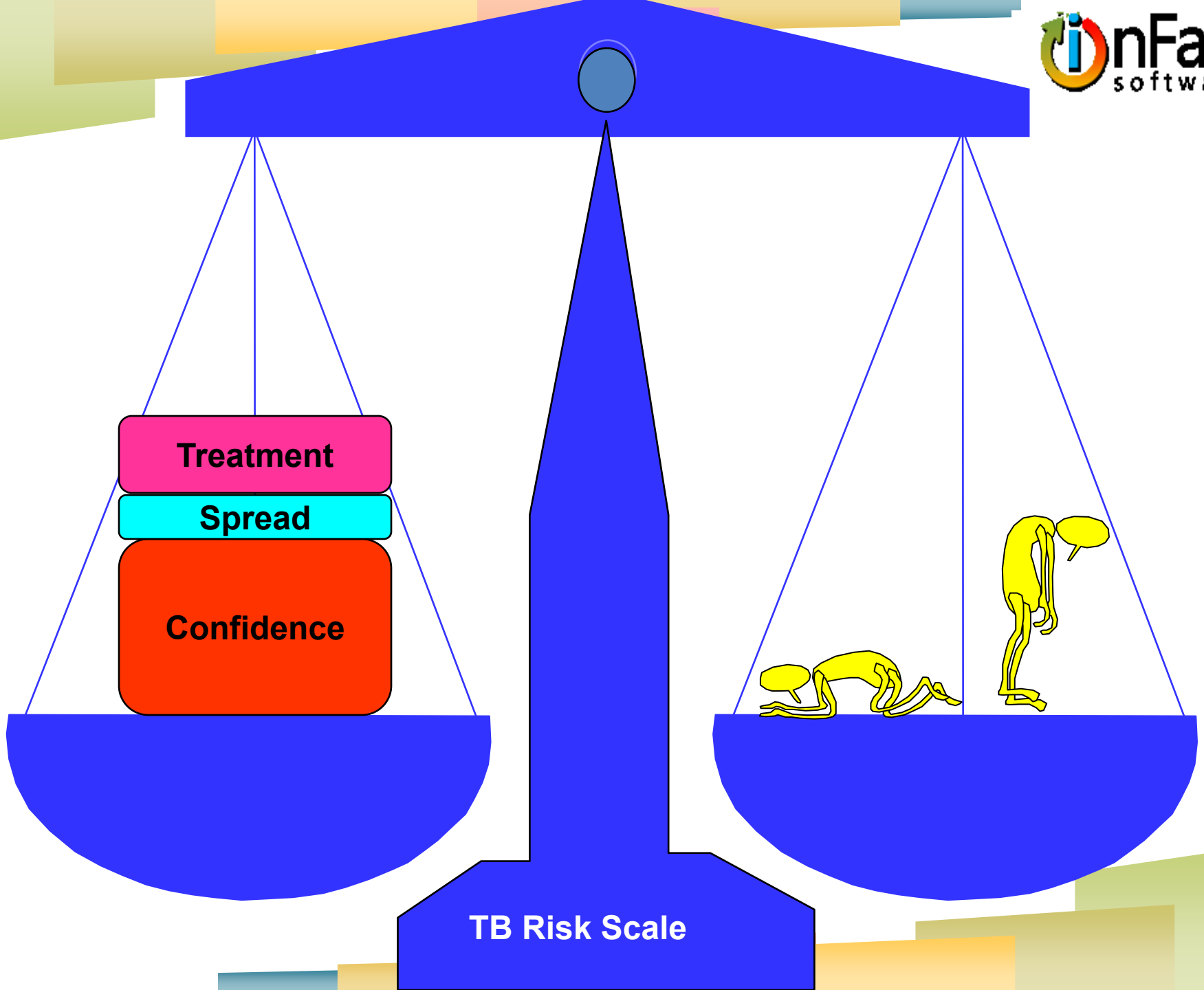


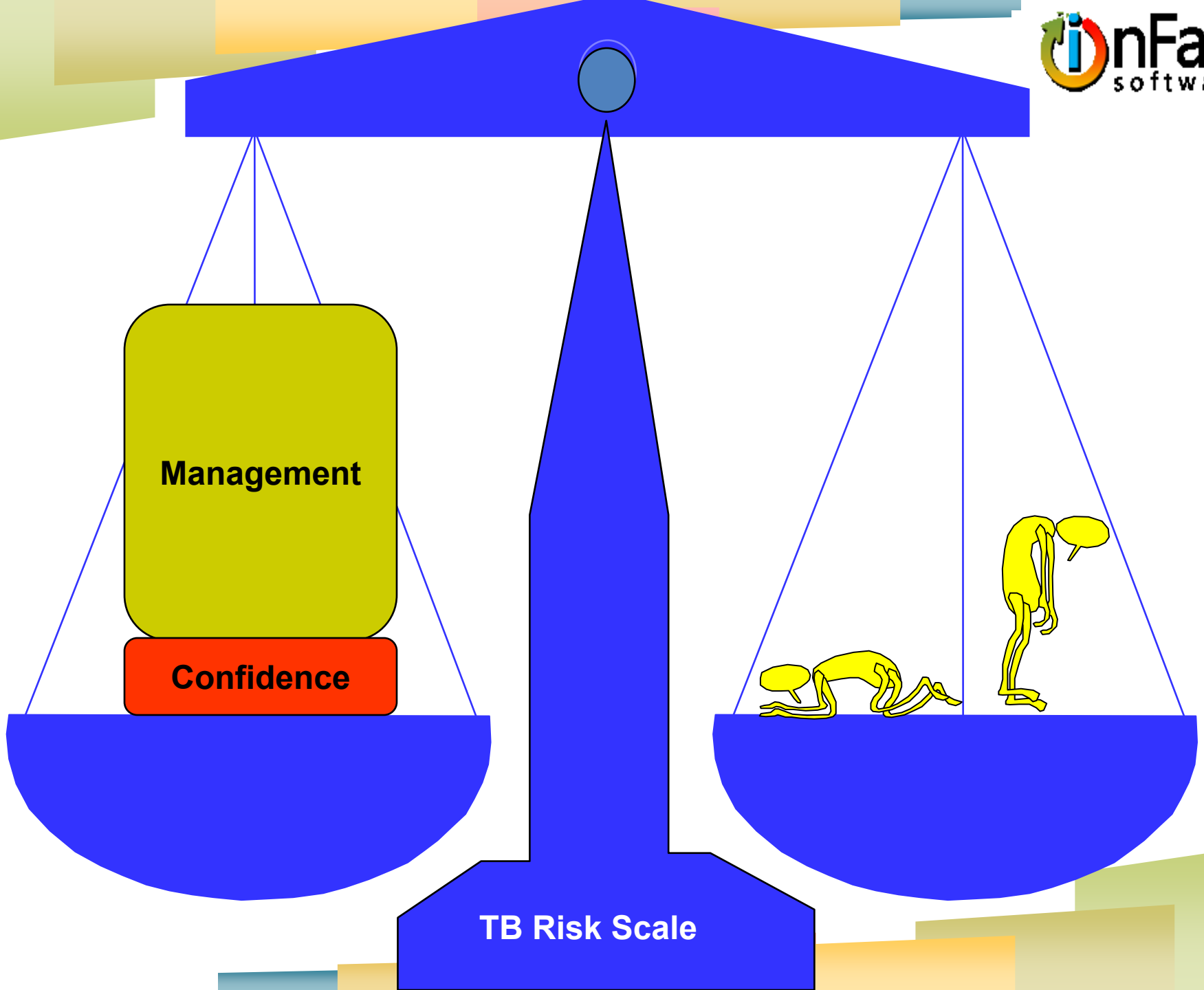
Spread

Confidence


Treatment
Management
Spread
Confidence
TB Risk Scale


Management
Spread
Confidence
TB Risk Scale


Treatment
Spread
Confidence
TB Risk Scale


Management
Confidence
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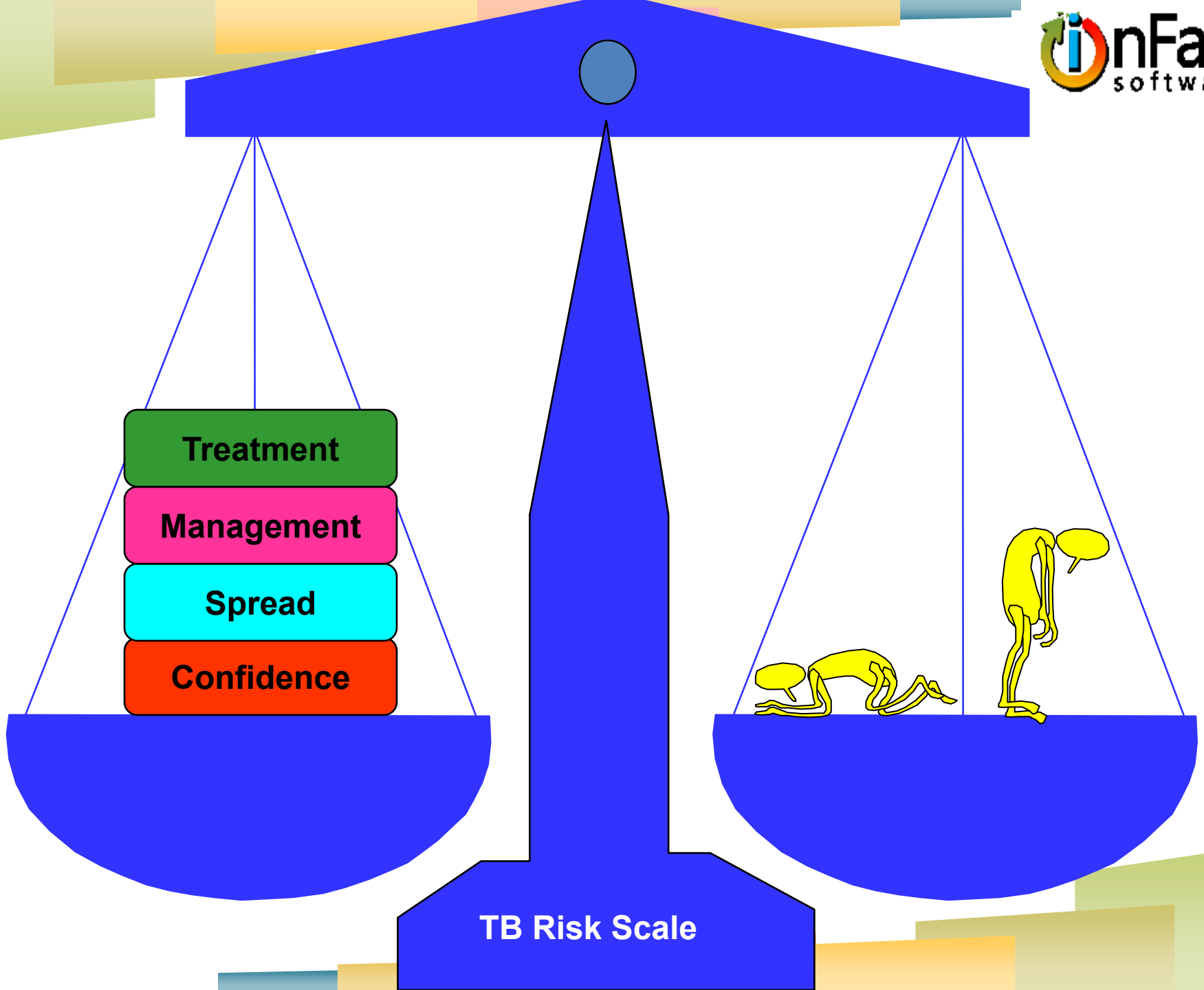
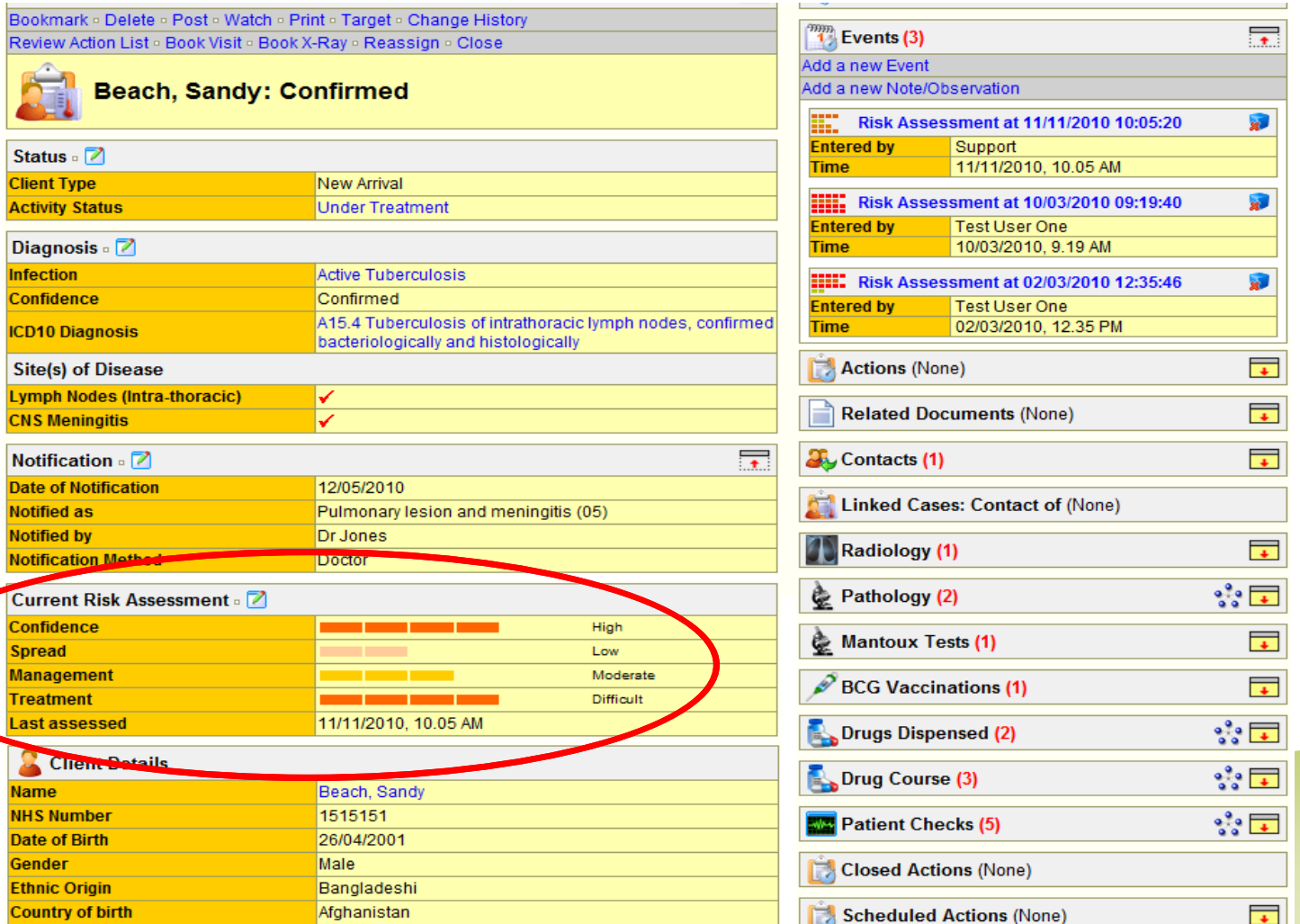
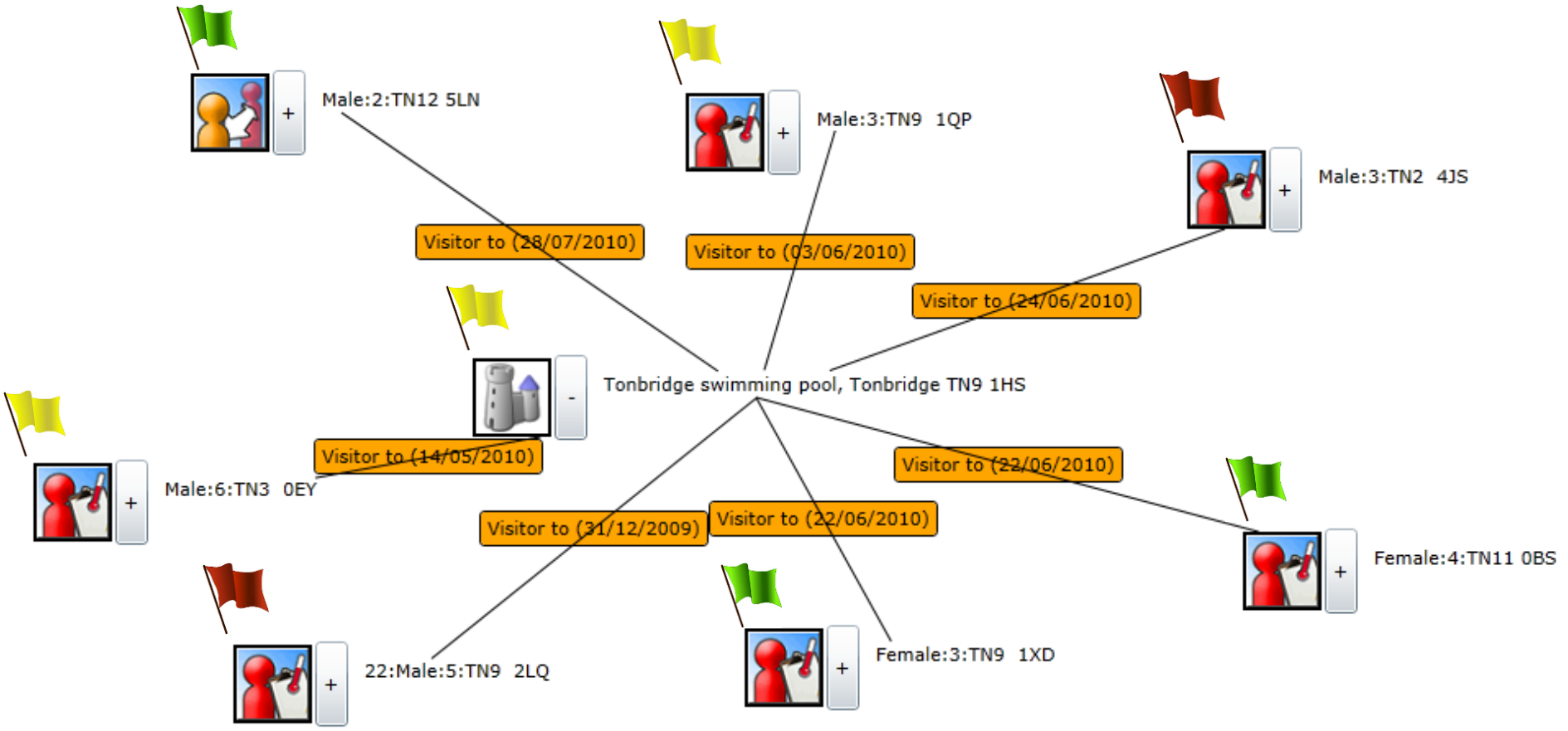

Treatment
Management
Spread
Confidence
TB Risk Scale

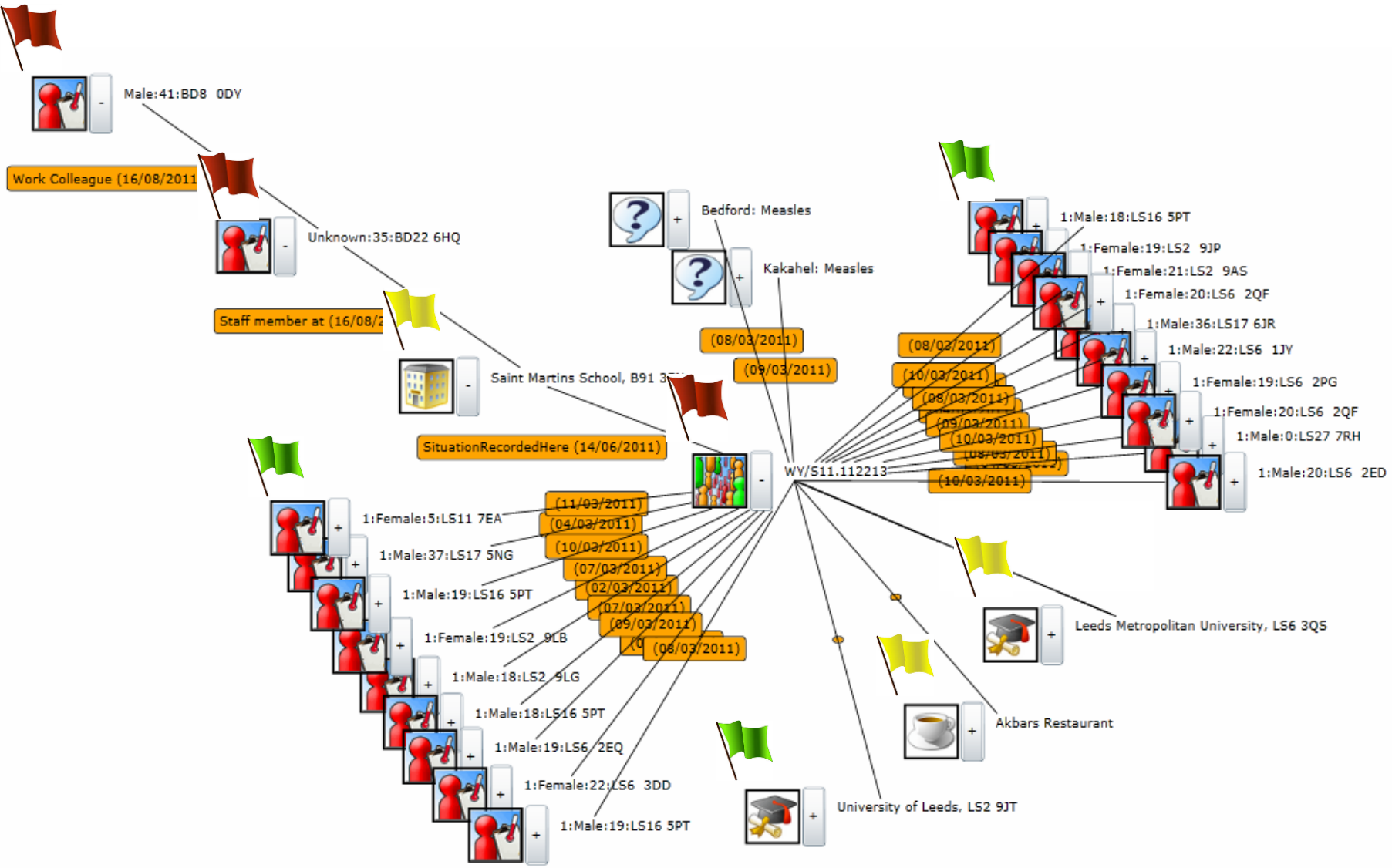
How the TB Risk Assessment Model can be used in practice



Making the Risk Assessment visual



Tracking High Risk Contributors



Advantages of the TB Risk Assessment model

- Easy to use
- Can be used to explain decisions
- Can prioritise corrective actions
- Provides a framework to record decision making
- Useful for handover of patient management
- Helpful for prioritising staff time
- Useful for rationally allocating limited resources

Conclusions

- RA is essential in Public Health
- RA is particularly important in cross-border infectious disease control
- RA provides defensible decision-making now and in the future
- RA facilitates the implementation of appropriate and timely control measures
- RA provides more effective operational communication
- RA helps improve preparedness and response.

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EMRIC +

“Risk Informed Decision Support in Public Health”

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