

# Building a tutorial on safe use of personal protective equipment

## Lessons learned from the Ebola crisis 2014



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Country Preparedness Support

ECDC - European Centre for Disease Prevention and Control

Société Française d'hygiène Hospitalière - Annual congress

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# What is ECDC?



- An independent agency of the European Union
- Operational since May 2005
- Based in Stockholm

▪ Mission:

detection

assessment

surveillance

communication

of risks to human health

caused by communicable diseases

• Including:

diseases of unknown origin

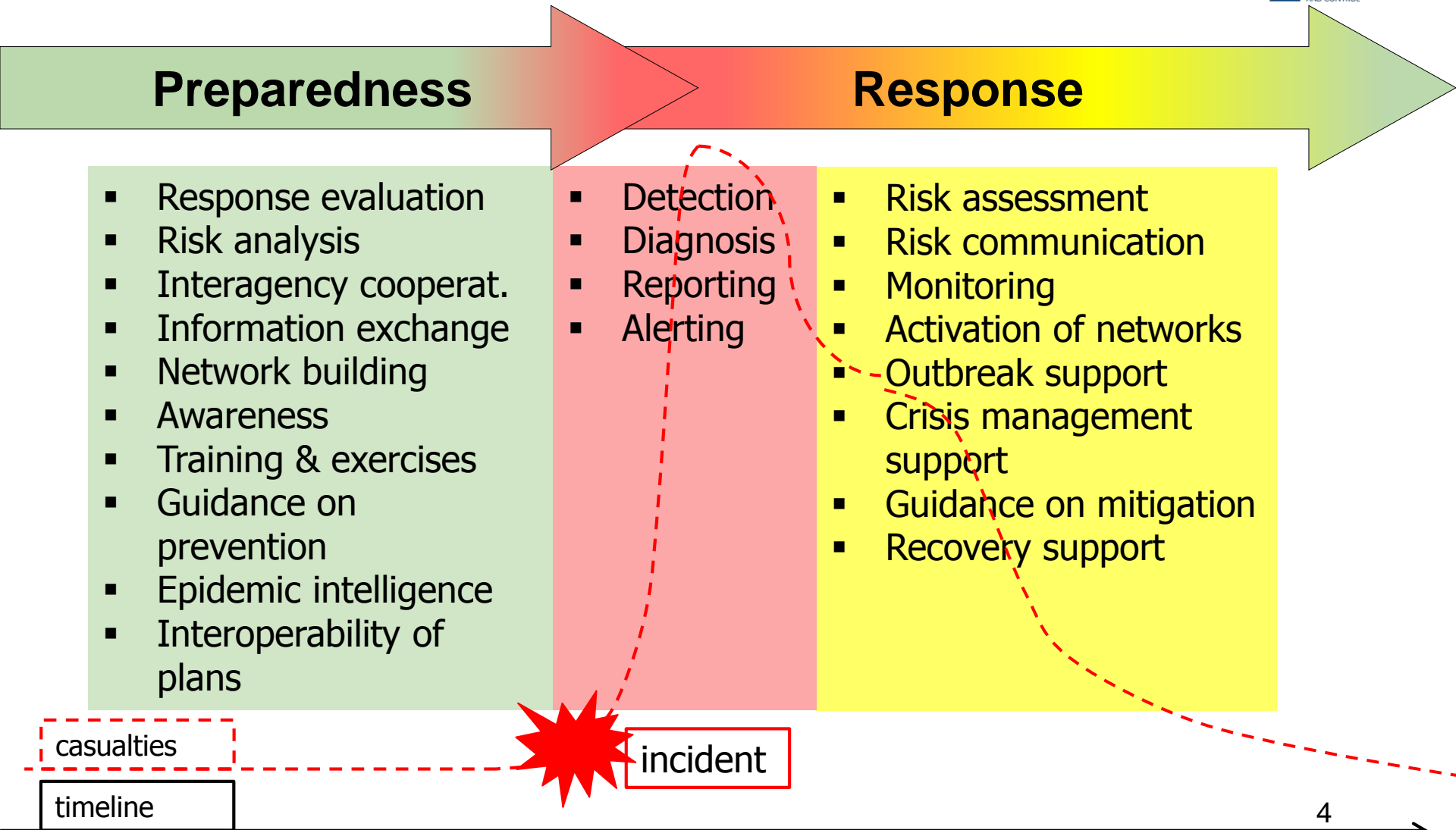
# ECDC behind the scenes



- Around 350 staff members from all 28 Member States
- Experts in communicable diseases, epidemiology, epidemic intelligence, risk assessment, communication, IT-tools, training, scientific methods, microbiology and bioterrorism
- 7 disease specific programmes addressing health risks with major impact on the EU
- Strong European and international networks



# ECDC's role in biological emergencies

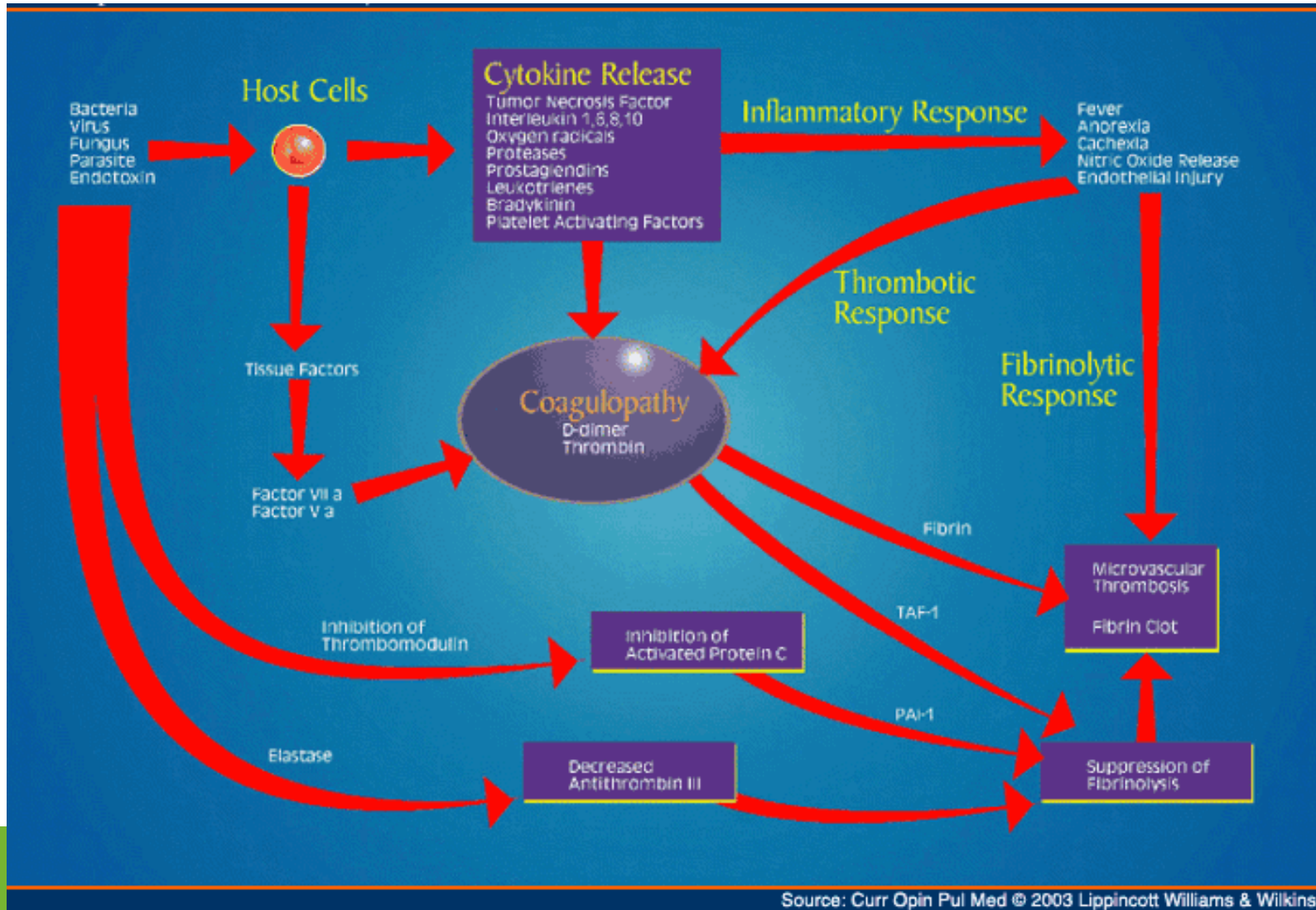


# Ebola and staff safety

- WHO reporting, 27 May 2015
  - Infected health care workers: 869 (total 27.013)
  - Healthcare workers died: 507 (total 11.134)
- 3 cases of hospital transmission outside W-Africa



# What happens inside? Sepsis!



# What improves outcomes?



# Consistency in staff protection



- Key for keeping health care functional during infectious diseases of high consequence
- Relevant occupational safety and health regulation
- Different operational environments
- Different levels of exposure risk
- Fit testing of respirators
- Regular training and refreshing
- Systems-approach not based on PPE alone

# PPE basic approaches

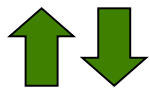
- Occupational health and safety
  - OSHA regulations – standard 1910
  - Directive 89/686/EEC
- Transmission based approaches
  - CDC: 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings
  - Contact, droplet, airborne precautions
- Situational adaption
  - CDC guidance for HCW in US hospitals managing EVD patients, update 20th Oct 2014

# Risk assessment for PPE adaption

## EXPOSURE

### WORKPLACE

- Rescue services
- Doctors offices
- Hospitals (ER, ICU)
- Treatment centres



### ACTIVITY

- 1st assessment
- Distance nursing
- Contact nursing
- Invasive monitoring & treatment (ICM)

## HAZARD

### PATHOGEN QUALITY

- Known/unknown
- Transmissibility
- Infectivity
- Pathogenicity
- Severity of disease
- Case fatality
- Out of reservoir resistance

## IMPACT

### VULNERABILITY

- Susceptibility
- Treatment options
- Prophylaxis options
- Ease of detection
- Diagnostic capabilities
- Decontamination options
- Scale of incident

# Staff & community protection: A systems approach

Distance

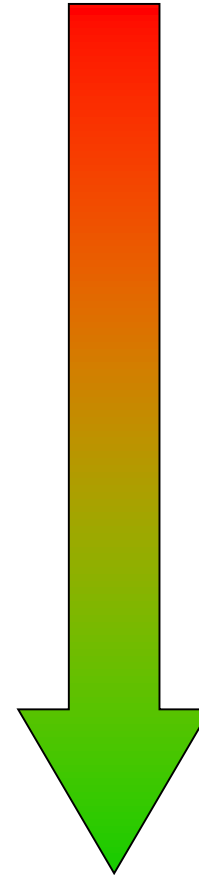
Hygiene and disinfection

Personal protective equipment

Isolation measures

Pressure gradients

Pre- / post exposition prophylaxis



**Transmission  
risk**

# Different activities – different PPE



# Infectious diseases of high consequence - IDHC



- Severe symptoms
- High case fatality rate
- No specific prophylaxis or treatment
- Require high level of care
- Human to human transmission
- Potential for large scale epidemics
- Examples
  - 1918 – Spanish influenza pandemic
  - 2003 – SARS
  - 2014/15 – Ebola W-Africa

# Conceptual challenges

- Classic "transmission based precautions" show limitations in real life
- ECDC expected to take leadership in opinion building on use of PPE for IDHC in Europe
- No evidence (in terms of EBM) for specific PPE components or processes to be safer than others
- At this stage no basis for technical consensus with recommendations from other organisations
- First line responders expect "something" to build on



**No gold standard yet. Admit different options as long they are based on sound rationales.**

# Basic PPE for high exposure risks (IDHC)



Option: Detail taping for closing gaps in the face (controversial procedure)

## Limitations of basic PPE

- Relatively short working times
- Complex donning and doffing processes
- Safe use requires intensive and repeated training
- Waste management rapidly gets overwhelming
- Basic PPE is a contingency resource but not the ideal approach for any kind of emergency.



Example for advanced PPE: PAPR (powered air purifying respirator) as commonly used in specialised treatment centres. Allows extended working times.

# ECDC's tutorial on safe use of PPE



- For treatment settings of patients with IDHC in European healthcare settings
- Primarily **not** targetting staff in high level isolation wards
- Preparing for future public health emergencies exceeding a 'single patient dimension'
- Applicable in a broad variety of emergencies
- Mainly based on single-use components
- Minimising secondary costs and work steps
- Provides no "gold standard" but different options for components & processes, including the rationale behind
- Requires adaption to specific workplace environments

# 2nd Dec 2014, v2: Major updates

- + Occupational safety and health aspects
- + Systematic risk assessment prior to selection of PPE components
- + Specific PPE for low exposure settings (e.g. first assessment PPE or distance nursing)
- + Specific PPE options for VHF or for airborne transmitted diseases
- + Details on barrier nursing principles
- + Supervision by a "barrier nursing guardian"
- + Highlight on manufacturers recommendations
- + Introduction of "the" hood



# "The" hood – easy adaption for VHF



- Splash proof hood with integrated surgical mask
- To be worn above of the FFP respirator
- No detail taping required
- "No skin exposed"

# Surgical mask vs respirator for standard care



No proven airborne transmission. All outbreaks in the past were controlled with contact and droplet precautions

There is evidence that other viruses (e.g. norovirus) are transmitted through aerosols produced during vomiting



CDC: Respirator  
WHO: Moulded (cup shaped) surgical mask  
PHE: Respirator  
PH Canada: Respirator only for AGPs

# FFP2 vs FFP3 respirator



FFP2 respirator is more comfortable and easier to use

FFP3 respirator provides better filtering and should minimise exposure

No comparative evidence

PHE: FFP3 for confirmed cases  
CDC: N95 (FFP2)

# No skin vs no mucosa exposure



Exposed skin may be contaminated by droplets and act as a vector for further transmission to mucosae during or after doffing or through invisible non-intact skin

Standard contact and droplet precautions were seen as sufficient to prevent transmission so far.

No comparative evidence

CDC recommends “no skin exposure”  
WHO: No mucosae exposure

# Gown vs coverall



Gowns are easier to remove and staff is already familiar with their use

Coverall provides more complete coverage

No comparative evidence

Both options are acceptable by WHO  
CDC recommends coverall

# Additional taping vs no taping



Taped connections gloves/boots with overall enable "one stroke" doffing;  
Additional barrier to fluids

No taping saves time in donning;  
Avoids pitfalls from improper execution (PPE damage, higher risk in doffing)

No comparative evidence

Some Member States do additional taping;  
WHO discourages taping and CDC indicates that taping has advantages and disadvantages

# Additional taping: Pitfalls



# Additional taping: Pitfalls



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# Goggles vs visor



Goggles provide better seal.

Visor avoids fogging, permits use of prescription glasses, permits use of surgical mask as it protects from droplets and splashes

No comparative evidence

CDC and WHO accept both options

# Actively-assisted vs self doffing



Facilitates doffing;  
critical handling of  
contaminated areas  
done under direct  
visual control

Self doffing  
eventually requires  
less staff;  
Avoids exposure of  
the additional staff

No comparative evidence

WHO recommends supervised self doffing



# Assisted donning



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# Assisted doffing – classical



# Assisted doffing – alternative



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# Assisted doffing



# Assisted doffing – innovative



# ECDC's 4 working principles for PPE



## 1. Build sustainability for future health threats

- PPE for infectious diseases of high consequence (IDHC)
- Models: VHF (contact/droplet) and airborne pathogens
- Large scale procurement for a EU standardised PPE stockpile
- Standardised training approach for Europe

## 2. Follow a setting- and risk-based approach

- Nursing and treatment in health care settings in Europe or in countries with comparable standards in health care
- Focus **not** on specialised treatment centres for IDHC
- Consideration of "secondary aerosolisation"
- Integration of occupational safety and health regulation

# ECDC's 4 working principles for PPE

## 3. Minimise exposure risks

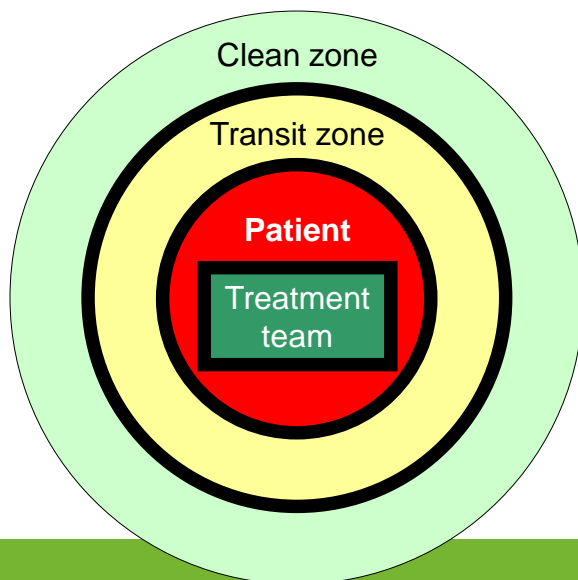
- Qualitative fit testing of respirators for any user
- Principle "no skin exposed"
- Actively assisted donning



# ECDC's 4 working principles for PPE

## 4. Minimise secondary contamination risks

- Fixed connections of gloves/boots to coverall enable "one stroke" doffing
- Actively assisted doffing
- 3 zones barrier nursing



# Procurement challenges

- Balance specificity/universality in a broad range of health care settings (isolation wards, ERs, ICUs, rescue services...)
- Balance specificity/universality in communicable diseases (viral haemorrhagic fevers vs. "infectious diseases of high consequence" incl. novel airborne pathogens)
- Right 'size mix' for (unknown) future user groups
- Quantities needed
- Seal fit in single use respirators (FFPs)
- Effective storage & distribution
- Limited shelf life

## An EU "PPE joint procurement" approach (2015)



- Prevents shortages in market availability and manufacturing capacities
- High procurement volume puts the buyer in a strong position:
  - Prices & conditions
  - Adaption to specific requirements
- PPE components allow various donning/doffing approaches
- PPE suitable for a broad spectrum of emergencies (low incidence – high impact events)
- Storage, renewal of stockpiles and distribution when needed remain on manufacturer side (service package)

# Google ECDC guidance on PPE





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Ungefähr 4.890 Ergebnisse (0,69 Sekunden)

Safe use of personal protective equipment in the ... - ECDC  
[ecdc.europa.eu/.../Publication\\_DispForm.aspx?...](https://ecdc.europa.eu/.../Publication_DispForm.aspx?...) ▾ Diese Seite übersetzen  
03.12.2014 - This **ECDC** tutorial entitled '**Safe use of personal protective equipment** in the treatment of infectious diseases of

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# Thank you!

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**“I LIKE YOUR SUIT  
BY THE WAY”**

