

Transmission Based Precautions – Literature Reviews

Pseudomonas aeruginosa

Search Strategy – RSV

PRINCIPAL RESEARCH QUESTION/OBJECTIVE:

Are contact precautions plus standard infection control precautions sufficient to prevent nosocomial transmission of RSV?

An additional literature search and review was carried out specifically on potential cross transmission of RSV by droplets from the respiratory tract. This was as a result of issues discussed at Transmission Based Precautions Steering Group meeting held in October 2007. Current evidence suggests that adherence to contact precautions and SICPs are sufficient to control RSV, however there is some discrepancy in the literature around the use of surgical masks.

<i>Period of publication</i>	1997-2007		
<i>Strategy key words (Full search strategies available on request)</i>	RSV	Occupational Diseases/	
	Respiratory Syncytial Virus\$	Cross Infection/	
	Respiratory Syncytial Virus, Human/	Infection Control/	
	Respiratory Syncytial Virus Infections	Health Personnel/	
	Respiratory Syncytial Viruses/	Personnel, Hospital/	
	healthcare worker\$.	Occupational Exposure/	
	health personnel	surgical mask\$	
	cross infection	mask\$	
	occupational transmission.	droplet precaution\$	
	occupational diseases	personal protective equipment	
	nosocomial	protective devices/	
	Disease Transmission, Patient-to-Professional/	masks/	
respiratory protective devices/	protective clothing/		
<i>Electronic databases (tick as appropriate)</i>	MEDLINE	X	PsycINFO
	Science Direct		EMBASE
	CINAHL	X	SIGLE
	Cochrane Library	X	Web of Science
	British Nursing Index	X	

<i>Additional Resources</i> (tick as appropriate)	References checked for relevant articles	X		
	Review of abstracts of professional meetings/ conferences			
	Personal libraries consulted			
	Experts consulted (give details if applicable)			
	Handsearching of journals (name relevant journals e.g. Journal of Hospital Infection, Infection Control and Hospital Epidemiology)			
<i>Websites</i> (tick as appropriate)	CDC	X	WHO	X
	Department of Health	X	Scottish Government	X
	HPA	X	Scottish Government Health Dept.	X
<i>How many papers found</i>	192			
<i>How many papers included</i>	11			
<i>How many papers excluded</i>	181			
ii) Selection criteria for inclusion of studies				
<i>Sample</i>	All health and social care workers.			
<i>Outcome measure(s)</i>				
<i>Other inclusion criteria</i>	Any study or guidance document not reviewed within the <i>CDC Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007</i>			
<i>Language Limitations</i>	English language only			
iii) Quality assessment				
Study quality assessment				
<p>The newly published <i>CDC Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007</i>, (Siegel et al., 2007) has been evaluated by five independent reviewers using the AGREE instrument (The AGREE Collaboration, 2001) which is designed to assess the methodological quality of guidelines. The results show the guidelines suitable for adaptation as primary reference source for literature review and formulation of recommendations.</p> <p>A literature search was conducted using HPS ICT search strategies, based on agreed research questions. Identified studies, not already reviewed within the CDC guidelines, were assessed for relevance and critically appraised using SIGN-50 methodology (SIGN, 2004) to determine if additional information or considerations were required for production of transmission based precautions for healthcare settings in NHS Scotland.</p> <p>The methodology for grading the supporting evidence is found on the Evidence Tables including Considered Judgment Section and available from the HPS Infection Control Team on request</p> <p>Category of Recommendation The recommendations have been categorised based on a combination of the system used in the CDC/HICPAC (Siegel et al., 2007) and EPIC 2 National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England</p> <p>Category IA - Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies. Category IB - Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale. Category IC - Mandatory or required for implementation Category II - Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale. GPP (Good Practice Point) – Is a recommendation for best practice based on the expert opinion or practical experience of the Model Policies Steering Group No recommendation; unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.</p>				

Data collation and analysis

The SIGN 50 methodology including reviewing templates are available from the SIGN website (<http://www.sign.ac.uk>)

The AGREE Instrument which is used for assessment and evaluation of the quality of evidence-based guidelines can be found at www.agreecollaboration.org

REVIEW STATUS (delete as appropriate)	Ongoing/Complete
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CONTACT PERSON	Heather Murdoch

1 RSV – a systematic review of the evidence

1.1 Infection control measure for RSV within Paediatric units

The literature search revealed a number of additional publications specifically on infection prevention and control of RSV within the paediatric settings.

One study (Madge et al., 1992) compared the effectiveness of four infection control strategies in the prevention of nosocomial transmission of RSV within a paediatric setting. This trial was conducted as a prospective control study and took place in 4 wards of one hospital during two winter epidemics of RSV. The authors of this study examined 4 approaches in the management of the RSV outbreaks in different wards, which were as follows; no intervention; cohort nursing; use of gloves and gowns alone; cohort nursing plus gloves and gowns. This study found that the combination of cohort nursing with use of gloves and gowns resulted in a significant decrease in the nosocomial transmission of RSV within the time period studied when combined with effective screening. The authors did not however, study the additional use of surgical masks and droplet precautions to determine if this would have further influenced the decrease in cross transmission.

The use of droplet precautions and surgical masks is specifically covered in a report of a long running intervention study designed to examine the effects of infection control measures on nosocomial transmission of RSV within a children's hospital. (Karanfil et al., 1999). The introduction of droplet precautions including the use of a surgical mask for close contact with the patients, and the introduction of a screening method which differed when dealing with occasional occurrence and during seasonal epidemics, was studied in comparison to contact precautions. The results of the interventions were studied for a prolonged period of 6 years and showed a statistically significant decrease in nosocomial RSV cases. The authors conclude that the use of mask was an important part of effective infection control measures. This study supports the use of a surgical mask for providing care for children with RSV to prevent onward transmission however, this intervention has been considered as part of a multi-factorial approach and it is hard to assign benefit to any individual component of the study.

A review article (Hall, 2000) published in *Clinical Infectious Diseases*, looked at the epidemiological evidence surrounding RSV outbreaks and nosocomial spread. The author highlights a number of articles which note that immunity to RSV is not life long and in fact there is evidence to show that adults particularly HCWs can become infected during RSV epidemic seasons. It can be difficult for RSV to be recognised from seasonal respiratory infections such as colds due to indistinctive symptoms and therefore infection amongst HCWs may be an important consideration. This paper concludes that RSV is spread primarily by droplet and contact routes. The importance of surveillance and advance warning of the presence of RSV in the community is crucial to alert staff. This author notes however that there is not conclusive evidence available regarding the specific use of masks in preventing nosocomial spread and that their use may be influenced by acceptability, which may be of concern in paediatric settings. However there is clear evidence regarding the use of contact precautions and the recommendation is that contact precautions in addition to specific recommendations within standard infection control precautions, regarding PPE should be sufficient.

A report on an outbreak at a paediatric hospital (Thorburn et al., 2004) concluded that the use of precautions including stringent hand hygiene, wearing of a single use apron and gloves in combination with cohort nursing effectively contained the outbreak, however specific use of masks and/ or gowns as part of an infection control strategy was not discussed.

A study was carried out as part of a quality improvement initiative specifically on the cost-effectiveness and benefit associated with infection control measures to prevent nosocomial

transmission of RSV within a large paediatric hospital (Macartney et al., 2000). This study examined the effect of multiple interventions which were applied throughout the RSV seasons over a 4 year period. The interventions included education; screening; contact precautions; isolation or cohorting; restriction of visitors suffering from respiratory symptoms and finally regular surveillance to monitor compliance. The study reported a statistically significant reduction in cases of RSV, although there were still a large number of cases occurring within an RSV season. This study did not examine the effects of application of droplet precautions or the potential role of staff as possible vectors for transmission of RSV.

An article written by the lead author of the CDC isolation guidelines (Siegel, 2002) addresses some of the controversial areas within infection control practices in paediatric settings including the management of RSV. The author acknowledges that infection control measures required for management of RSV remain controversial. Screening of visitors and staff for respiratory symptoms has been identified in a number of studies as beneficial, in addition to the use of optimal transmission based precautions and screening of visitors and staff for symptoms of respiratory infection indicative of RSV. It is clear that the main routes of transmission of RSV are via droplet and contact route, and that the membranes of the conjunctiva and nasal mucosa are important portals of entry, however the use of masks has not been conclusively proved to impact on improved outcomes. It is notable, however that many of the published studies within this area tend to use a multi-factorial approach. In addition a number of publications report successful management of outbreaks of RSV within high risk settings which have not used surgical masks or eye goggles however, this does not negate the use of standard infection control precautions which stipulate that masks and eye protection must be worn if there is an anticipated exposure to blood or body fluid splashing and this includes respiratory secretions. It is clear from this article that although this author does not consider the requirement for the use of surgical masks to be conclusive that other elements of effective infection prevention and control of RSV must be implemented e.g. screening, isolation or cohorting and screening of visitors and staff for signs of respiratory infection combined with education.

Another recently published study (Simon et al., 2006) looked at a programme of surveillance and infection control interventions within a paediatric setting. The interventions included; gowns, masks, gloves, stringent hand hygiene and adherence to cleaning and disinfection of care equipment and environment and compared to the use of isolation. This study specifically recommended the use of masks to reduce nosocomial spread with the use of eye protection only during outbreak situations.

The CDC Isolation guidance (Siegel et al., 2007) have reviewed scientific evidence surrounding the use of eye protection in addition to a surgical mask which has been studied specifically for RSV and shows that its use reduced occupational transmission of RSV. However the authors state that the link to the evidence is not clear and quote more recent studies which show that contact precautions plus standard infection control precautions is sufficient to reduce cross transmission.

1.2 RSV and immunocompromised patients

A number of the published studies involved research where multi-factorial approaches were examined. One of these (Garcia et al., 1997) looked at the use of surgical masks in addition to gowns and gloves and stringent hand hygiene, by all persons entering the room of bone marrow transplant patients, during an RSV epidemic as RSV can cause serious illness within this group. The researchers also studied the effect of prompt isolation or cohorting and provision of anti-viral drug therapy in addition to staff education. The results showed that after the introduction of these interventions that there was a significant reduction in RSV transmission during the period studied. However, all of the interventions were assessed together and the authors note that the use of surgical masks for RSV is somewhat controversial although their use may be beneficial in combination with other measures. The authors also note that the positive effect of the use of masks for droplet precautions in the case of other

respiratory diseases has been well documented and therefore the use for this patient group seems a common sense approach.

An article was published detailing the measures taken to control an outbreak of RSV in a bone marrow transplant ward (Jones et al., 2000). The authors discuss that immunity to RSV tends to be transient and that HCWs can become the vectors for nosocomial spread by indirect contact and also occasionally by becoming infected. This patient group is extremely vulnerable to RSV infection with mortality rates as high as ~90%. Therefore stringent measures were adopted including isolation of initial case, and cohort nursing in a separate ward. Within this study, the use of aprons and gloves was enforced but masks were not used. However, there were other measures introduced within the time period assessed including specific drug therapy and exclusion of children under the age of 12 from the ward, therefore since this was necessarily a multi-factorial approach, it is therefore difficult to attribute beneficial effects to any particular intervention. The results however support the use of the infection control measures that are currently recommended within the CDC Isolation guidelines.

A review paper (Black, 2003) which focuses mainly on the evaluation of efficacy of treatment regimes for the management of RSV, discusses the results of one study on required infection control measures and concludes that the use of mask and eye protection is required only if exposure to splashing of body fluids such as respiratory secretions is anticipated and during the carrying out of aerosol generating procedures. This review, has a substantial section specifically looking at the mechanisms of RSV infection and it is clear from this and other studies that although most people acquire this infection by the age of 2, re-infection can occur throughout life, although in adulthood the respiratory symptoms may be mild and self limiting. Therefore this route of infection, through HCWs and visitors cannot be discounted and therefore the lack of the use of masks and eye protection would only be acceptable alongside education of staff and visitors on the importance of not working or visiting if suffering from respiratory symptoms. This virus survives in the environment for potentially long periods of up to 12 hours and therefore the importance of hand hygiene and environmental cleaning cannot be over emphasised in infection prevention and control measures.

A report published in 2003 (Morales et al., 2003) further substantiates the importance of education of HCWs regarding the importance of not providing care to patients with increased susceptibility to infection, if suffering from respiratory symptoms. This report looks at a case of nosocomial RSV infection in a renal transplant patient and it was noted that three HCWs at the time had been suffering from mild respiratory symptoms, the author recommends that mask should have been worn by the HCWs in conjunction with rigorous hand hygiene, in this case for the protection of the patient group.

The microbiological evidence on RSV supports the use of droplet precautions to prevent the transmission of infectious droplets from the respiratory tract reaching the mucous membranes of susceptible individuals in common with all respiratory infections. However it is acknowledged that this does not always happen in practice and RSV is mainly controlled by the contact precautions. This is sometimes due to lack of acceptability by the patient group, e.g. in paediatric settings and there is some indication people believe that have had exposure to this infection prior to the age of 3, therefore have acquired immunity, however scientific evidence does not support this. The CDC guidance currently recommend that RSV is controlled by adherence to contact precautions, but that surgical masks must be worn in line with standard infection control precautions when exposure to blood and body fluids including respiratory secretions is anticipated.

2 Conclusions

- 2.1 The literature search revealed a number of additional publications specifically on infection prevention and control of RSV within the paediatric settings.
- 2.2 The studies all examined the effect of multifactorial interventions and therefore it was difficult to directly attribute a favourable outcome with one particular intervention.
- 2.3 It is not clear from a review of the scientific evidence why RSV is treated differently than most respiratory infections and not assigned to droplet precautions.
- 2.4 There are concerns within paediatric settings over the acceptability of wearing surgical masks with this particular patient group.
- 2.5 It is assumed that most people have been infected by RSV by a young age and therefore acquire immunity; however it is clear from microbiological evidence that immunity is short lived and this infection can be caught as adults usually exhibiting as a mild respiratory infection and difficult to distinguish from other respiratory infections such rhinovirus.
- 2.6 A number of outbreak case reports and intervention studies have reported that control of RSV has been achieved by the use of contact precautions and standard infection control precautions, and include the use of surgical mask and possibly eye protection if exposure to splashes of body fluids is anticipated (including respiratory secretions).
- 2.7 A combination of cohort nursing, gowns and gloves was found to produce a statistically significant reduced number of nosocomial RSV infections.
- 2.8 One long running intervention study has concluded that the use of surgical masks for close care is an important part of effective infection control of RSV, although this again formed part of a multi-factorial study and it is hard to assign benefit to any individual intervention.
- 2.9 The importance of surveillance for alerting staff to the presence of RSV in the community has been highlighted.
- 2.10 Several authors note that the use of contact precautions plus wearing of masks and eye protection if splashing of blood or body fluids, including respiratory secretions is anticipated in line with standard infection control precautions is sufficient for controlling spread of RSV.
- 2.11 Some mention is made in the literature of the importance of screening of visitors for respiratory symptoms although it is not clear what action should be taken.
- 2.12 One reviewed scientific publication mentions the importance of screening of staff for respiratory symptoms.
- 2.13 This article by the lead author of the CDC Isolation guidelines identifies that the main routes of transmission of RSV are droplet and contact and that the membranes of the eyes and nose are important portals of entry, however the author goes on to state however that the use of masks has not been conclusively proved with respect to RSV.

- 2.14 This article emphasises the importance of SICP recommendations for wearing a mask and eye protection in conjunction with screening for RSV, isolation or cohorting and screening visitors or staff for symptoms of respiratory illness.
- 2.15 A number of studies mention the importance of wearing of a surgical mask to prevent spread of RSV, however all studies are multi-factorial and therefore it is hard to assign benefit to a particular intervention.
- 2.16 The use of surgical masks as part of droplet precautions is a common sense approach and has been well documented in the case of other respiratory disease.
- 2.17 One report on a case of nosocomial RSV infection in a renal transplant patient documented that 3 HCWs working in the unit had mild respiratory symptoms. The author recommends that a mask should have been worn for protection of the patient group or there should have been re-deployment of the staff.
- 2.18 It is clear that the infection control measures required for management of RSV are still contentious.

Overall conclusion

The microbiological evidence on RSV details that infection results in short term partial immunity and is therefore likely to reoccur throughout adult life, albeit as generally mild respiratory illness difficult to differentiate from rhinovirus. From review of the scientific publications specifically on RSV it is clear that this infection can cause substantial morbidity and mortality within paediatric settings, particularly amongst neonates, who have immature immune systems and other co-existing conditions such as prematurity related conditions, and in immunocompromised adult setting such as renal transplant units or bone marrow transplant units.

The scientific literature highlights that this infection is transmissible by droplets from an infected respiratory tract and also by the contact route and it is clear that the virus is also capable of reasonably long term survival in the environment on surfaces such as door handles, patient care equipment etc in common with a number of other respiratory infections e.g. influenza. This thereby supports the use of droplet precautions to prevent the transmission of infectious droplets from the respiratory tract reaching the mucous membranes of susceptible individuals in common with all respiratory infections and of contact precautions to prevent indirect cross transmission via e.g. hands of HCWs.

However it is acknowledged that the use of surgical masks does not always happen in practice and this may be due to the fact that most cases are in paediatric settings where there is perhaps a lack of acceptability of wearing of surgical masks by this specific patient group. In addition there is evidence to suggest that RSV is controlled mainly by the adherence to contact precautions. The CDC Isolation guidelines state that contact precautions should be used to prevent cross transmission of RSV but with adherence to standard infection control precautions particularly regarding the wearing of masks and eye protection when exposure to splashes of blood and body fluids including respiratory secretions is anticipated. This is supported by reference to a number of studies showing that this is sufficient to reduce the spread of RSV. However, in order for this to be fully effective it would need to take into account a possible spread by HCWs with respiratory symptoms and therefore stress the importance of HCWs reporting even mild respiratory symptoms with a view to use of additional precautions e.g. use of surgical masks or re-deployment to other areas.

On review of the scientific literature, the issue of precautions required for the prevention of transmission of RSV remains a contentious issue. There is evidence to suggest that adherence to

contact precautions plus standard infection control precautions is sufficient to control spread, however it is not clear from the literature review why the precautions applied for RSV should be different than for other respiratory viruses e.g. influenza, especially when nosocomial transmission remains a significant problem within healthcare settings.

It is clear that the issue of whether droplet precautions are required to prevent the spread of RSV is still contentious and there is a lack of sound scientific evidence to support either the use of full droplet precautions including a surgical mask, or the use of contact precautions alone.

3 Recommendations –Precautions

- 3.1 It is recommended that this issue is referred to the Model Policy Steering Group in order to reach consensus opinion.

4 Practical Application

- 4.1 Refer to decision of the Steering Group

5 Resource Implications

- 5.1 Refer to decision of the Steering Group

6 References

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