G.22 Prevention of Cross-infection

Review question 1: What is the effectiveness of cohorting on the basis of pathogen status versus not cohorting on the basis of pathogen status in reducing transmission of CF pathogens?

Review question 2: What is the effectiveness of different models of segregating patients in reducing transmission of CF pathogens?

Review question 3: What is the effectiveness of individual protective equipment in reducing transmission of CF pathogens?

Review question 4: What is the effectiveness of the combination of cohorting, segregating and protective equipment in reducing transmission of CF pathogens?

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Full citation Griffiths, A. L., Wurzel, D. F., Robinson, P. J., Carzino, R., Massie, J., Australian epidemic strain pseudomonas (AES-1) declines further in a cohort segregated cystic fibrosis clinic, Journal of Cystic Fibrosis, 11, 49-52, 2012 Ref Id 367562 Country/ies where the study was carried out	Sample size See Griffiths 2005 Characteristics See Griffiths 2005 Inclusion criteria See Griffiths 2005 Exclusion criteria See Griffiths 2005	Interventions See Griffiths 2005	Details See Griffiths 2005	Results See Griffiths 2005	Limitations See Griffiths 2005 Other information See Griffiths 2005

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
See Griffiths 2005 Study type See Griffiths 2005 Aim of the study See Griffiths 2005 Study dates See Griffiths 2005 Source of funding See Griffiths 2005					
Full citation France, M. W., Dodd, M. E., Govan, J. R., Doherty, C. J., Webb, A. K., Jones, A. M., The changing epidemiology of Burkholderia species infection at an adult cystic fibrosis centre, Journal of Cystic Fibrosis, 7, 368-72, 2008 Ref Id	Sample size Not reported Characteristics Adults with CF Age not reported Inclusion criteria All patients cared for by the Manchester Adult CF Centre between 1986 and 2006 inclusive Exclusion criteria Not reported	Interventions Intervention 3. Cohort segregation combined with individual segregation. A policy of isolation was introduced for patients infected with all Burkholderia species. This policy involves patients not having any contact with other patients, either at an inpatient or outpatient level. Patients being admitted to single rooms during admissions and attending outpatient appointments and being immediately isolated within their own clinic room.	Details Setting. Manchester Adult CF Centre. Intervention 1 was introduced in 1991. Intervention 2 was introduced in November 1993. Intervention 3 was implemented in 2000. Data collection. All cases of respiratory infection by Burkholderia cepacia complex (Bcc) species or other Burkholderia species, including B. gladioli, have been recorded at the centre since 1983. In 2001, all Manchester Bcc isolates stored in the repository from 1983 onwards were	Results Incidence of patients infected with transmissible pathogens Incidence of infection with Burkholderia species: Post-intervention 1 (1992 data): 16.3% vs comparison 1 (1983-1990): varied from 3 to 5% Incidence of infection with Burkholderia species: Post-	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (Intervention and control group drawn from different years. Prior to 1991, there was no evidence of Burkholderia cross-infection at the centre. The first transmissible strain emerged in 1991 after a Manchester

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
367547 Country/ies where the study was carried out UK Study type Retrospective before and after study Aim of the study To review the impact of changing infection control practices at the Manchester Adult CF Centre upon the epidemiology of Burkholderia species infections. Study dates Not reported Source of funding Not reported		Patients with Burkholderia species infection were cohorted into separate wards to non-Bcc infected patients and attended a different outpatient clinic. Intervention 2. Cohort segregation. Patients with Burkholderia species infection were cohorted into separate wards to non-Bcc infected patients and each inpatient has their own single room. Patients with Burkholderia species infection attended a different outpatient clinic. Isolation policy for patients with Burkholderia species not yet implemented Intervention 1: Incomplete cohort segregation. Patients with Burkholderia species infection were admitted to inpatient beds on the opposite side of the corridor to non-Burkholderia species infected patients. There was continued patient mixing within a day-room facility on the ward and within areas such as the radiology department. Patients with Burkholderia species infection attended separate outpatient clinics to other CF patients.	identified to species level and strain typing performed by pulsed-field gel electrophoresis (PFGE). Data relating to species identification and strain typing of all available B species isolated at the centre from 1983 to 2006 inclusive were reviewed from the centre database. Data analysis. Burkholderia isolates exhibiting similar PFGE patterns and displaying evidence of cross-infection involving two or more CF patients were termed transmissible strains.	intervention 2 ("following complete cohort segregation"): <3% for all but one year vs post-intervention 1 (1992): 16.3% Prevalence of patients infected with transmissible pathogens Prevalence of Burkholderia species infection: post-intervention 3 (2005 data): 9.3% vs post-intervention 2 (1994 data): 31.2% Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	patient returned from a CF holiday camp in North America) Comparability: High risk (Study does not control for any factor, only descriptive data on incidence) Outcome: High risk (Low quality reporting. However please note that a strength of this study is that genotyping was used to understand how changes in incidence were related to cross-infection and to transmissible strains as opposed to unique strains) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
		Comparison 1. No infection control measures to prevent B. cepacia complex cross-infection No details			
Full citation Frederiksen, B., Koch, C., Hoiby, N., Changing epidemiology of Pseudomonas aeruginosa infection in Danish cystic fibrosis patients (1974-1995), Pediatric Pulmonology, 28, 159-66, 1999 Ref Id 330831 Country/ies where the study was carried out Denmark Study type Retrospective before and after study Aim of the study To evaluate the impact of the	Sample size N= 107 in 1974; 256 in 1995. Characteristics Patients with CF. Median age: 9.0 in 1974, 18.5 in 1995. Inclusion criteria Patients with CF attending the Copenhagen CF centre between 1974 and 1995. Exclusion criteria Not reported	Interventions Intervention: Cohort segregation The CF centre was reconstructed, separating the wards and the outpatient clinic Patients with PA in their sputum were separated from patients without PA in the wards, in the outpatient clinic, and during social events. Comparison: No cohort segregation The wards with inpatients receiving iv treatment were near the outpatient clinic visited by all CF patients CF patients were not segregated according to presence or absence of PA in their sputum	Details Setting. Copenhagen CF centre. Cohort isolation of patients with PA started in 1981. Data collection. A database was constructed based on the monthly cultures of each patient for the period January 1974-December 1995. Precipitating antibodies were detected by crossed immunoelectrophoresis at least once a year. Each patient had an average of 10 sputum cultures per year. Data analysis. Chronic infection was defined as persistent presence of PA for at least 6 consecutive months, or less when combined with the presence of two or more PA precipitins. Intermittent PA colonization was defined as a culture of PA at least once and presence of normal levels of precipitating antibodies against PA (0-1). For yearly prevalence, a patient was categorized as PA-positive	Results Incidence of patients infected with transmissible pathogens New cases of intermittent PA/patients at risk (annual incidence): Post-intervention: 9/40 (1982 data) vs comparison 15/45 (1980 data) New cases of chronic PA/patients at risk (annual incidence): Post-intervention: 7/69 (1982 data) vs comparison 15/75 (1980 data) Prevalence of patients infected with transmissible pathogens Graphic reporting, unclear reporting in text Quality of life Not reported	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: Low risk (Intervention and comparison group were drawn from different years, however 1980 and 1982 are the closest pre- and post-intervention full years; there is uncertainty about the infection status of patients in-between cultures which means that some supposedly "at risk" patients may have had the infection when the intervention started, however cultures were performed on average 10 times per year for each patient, which reduces this uncertainty).

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
following interventions on the changes in the epidemiology of PA: 1. elective antibiotics for 14 days every 3 months to patients with chronic PA infection (started in 1976); cohort isolation of patients with PA to prevent cross-infection (starting in 1981); early intensive treatment with inhaled colistin and oral ciprofloxacin from time of initial colonization (1989). Study dates Not reported. Source of funding Not reported			if just one of the yearly samples was positive for PA or if just one of the early samples was defined as chronic PA. The incidence of PA isolations was defined as the number of new cases with intermittent or chronic PA cultures during a year, divided by the total population at risk (the number of patients who never had intermittent or chronic PA).	Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	Comparability: High risk (Authors do not adjust for any factor, only descriptive data on incidence are presented) Outcome: High risk (No genotyping was used so that it was not possible to assess whether new cases had the same strains and were related to cross-infection. However, the following strengths were noted: Authors mention that there was uniform data collection over the years based on monthly visits of patients to the CF centre. There is uncertainty about the infection status of patients in-between cultures, however cultures were performed on average 10 times per year for each patient, which reduces this uncertainty. Adequate follow-up

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					period for outcome of interest.) Other information
Full citation Waine, D. J., Whitehouse, J., Honeybourne, D., Cross-infection in cystic fibrosis: the knowledge and behaviour of adult patients, Journal of Cystic Fibrosis, 6, 262-6, 2007 Ref Id 366998 Country/ies where the study was carried out UK Study type Survey Aim of the study To investigate adult patients' knowledge	Sample size 184 patients were invited to participate, 94 completed the questionnaire Characteristics Demographic data was available for 90 respondents. Mean (SD) Age: 27.2 (8.5) Sex: 58.9% were males. Inclusion criteria All patients attending a clinic appointment at the West Midlands Adult CF Centre during June and July 2005 were offered a questionnaire to complete. Questionnaires were also offered to inpatients who were due to attend the clinic during the same	Interventions Intervention: Individual separation Not mixing with patients with CF Comparison:No individual separation Mixing with other CF patients	Details Setting. West Midlands Adult CF Centre, UK. Data collection. After 10 patients had completed a pilot questionnaire, the results were examined and the questionnaire updated. Data analysis. Descriptive analysis. Percentages of responses were calculated for each question.	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens Not reported Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Of the 48 patients who deliberately avoided contact, 30 (62.5%) said that their quality of life did not suffer as a result.	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (51.1% response rate; comparability between respondents and non-respondents was not assessed) Comparability: High risk (Study does not control for any factor, only a descriptive summary for each group is provided) Outcome: High risk (Self-report; the questionnaire was the result of modifications on a pilot questionnaire) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
about cross-infection risk and their related behaviour. Study dates Not reported Source of funding DJW is funded by the Heart of England Foundation Trust and the Heartlands CF Appeal Charity.	period. Questionnaires were posted to 8 patients colonized with the B. cepacia complex, who attended a separate clinic Exclusion criteria Not reported			Of the 43 who did not avoid contact, 10 (23.3%) said that their quality of life would suffer a 'significant amount' or 'a great deal' if they were to begin avoiding others. Of those who mixed with others, 51.1% said their quality of life would not suffer at all if they avoided others with CF Staff experience Not reported Staff and patient compliance Not reported in relation to relevant intervention	
Full citation Griffiths,A.L., Armstrong,D., Carzino,R., Robinson,P., Cystic fibrosis patients and families support cross-infection measures, European Respiratory	Sample size N= 291 were sent the questionnaires, 190 responded (114 parents alone (60%), 75 completed the questionnaire together with a child of >=12 yrs (40%), 1 questionnaire completed by child only). Characteristics	Interventions Intervention: Combination of cohort and individual segregation. Cohort segregation was based on five separate groups: PA positive; epidemic strain PA; B. cepacia; MRSA; and PA negative. Inpatients were nursed in separate sections and attended	Details Setting. CF clinic at the Royal Children's Hospital. Data collection. A questionnaire was sent out to the families of all patients in the state of Victoria and responses were returned by reply paid post. The answer was a three-point scale: positive, negative and unsure. The	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens Not reported	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: Unclear risk (All patients were selected; the response rate was 65%; the comparability

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Journal, 24, 449-452, 2004 Ref Id 113827 Country/ies where the study was carried out Australia Study type Survey Aim of the study To assess CF parent and patient responses to the segregation measures instituted at the hospital to determine overall support. Study dates Survey was carried out between May and December 2002, two years after the introduction of segregation measures. Source of funding	Parents of children with CF or parents together with patients with CF if aged >= 12 years. Mean age: unclear Females/males: unclear Inclusion criteria Families of all patients in the state of Victoria Exclusion criteria Not reported	physiotherapy sessions at different times. Those children infected with epidemic strain PA, MRSA or BC were isolated from each other and all other patients Those within the other groups were allowed to mix within their cohort groups. Comparison: Usual care	questionnaire was designed de novo and has not been validated. Responses were anonymous. Data analysis. Chi-squared or Fisher's exact test were used to assess individual responses and to compare responses between parents and children.	Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Patient satisfaction: Children with CF (>=12 yrs) overall response to segregation measures: positive: 48/76 (63%), negative: 9/76 (12%), unsure: 19/76 (25%) (p<0.001) Carer satisfaction: Parents' overall response to segregation measures: positive: 160/189 (85%), negative: 7/189 (4%), unsure: 21/189 (11%) (p<0.001) Staff experience Not reported Staff and patient compliance Not reported	between respondents and non-respondents was not established) Comparability: High risk (Study does not control for any factor) Outcome: High risk (Self-report with anonymous questionnaire (not validated); the statistical test is clearly described and appropriate, and p values are presented) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
This study was supported in part by the Royal Children's Hospital Cystic Fibrosis Research Trust (Melbourne, Australia).					
Full citation Griffiths, A. L., Jamsen, K., Carlin, J. B., Grimwood, K., Carzino, R., Robinson, P. J., Massie, J., Armstrong, D. S., Effects of segregation on an epidemic Pseudomonas aeruginosa strain in a cystic fibrosis clinic, American Journal of Respiratory & Critical Care Medicine, 171, 1020-5, 2005 Ref Id 367561	Sample size N people= 325 (1999), 291 (2002). N sputum producers: 153 (1999), 149 (2002) Characteristics Paediatric patients with CF. Number of sputum producers in each age groups: <10: 41 (2002), 39 (1999); 10-12: 34 (2002), 34 (1999); 13-15: 36 (2002), 42 (1999); >=16: 38 (2002), 38 (1999). Sex: not reported. Inclusion criteria Patients attending the CF clinic at the Royal Children's Hospital in Melbourne. Exclusion criteria Not reported	Interventions Intervention: Cohort segregation Cohorts: PA (negative, positive non-epidemic, epidemic PA (AES-1)) Separation of cohorts was maintained at outpatient visits and during hospital admissions. Standard infection control measures were reinforced, and education seminars were arranged for staff and families. Comparison: No cohort segregation. No segregation based on PA. Standard infection control measures B. Cepacia complex and MRSA strict individual segregation	Details Setting. CF clinic at the Royal Children's Hospital in Melbourne. Intervention introduced in January 2000. Data collection. The CF research database and laboratory records were surveyed for sputum culture and pulsed-field gel electrophoresis results. Children were seen every 3 months, and sputum was collected from expectorating patients. An independent laboratory scientist randomly selected a single mucoid and nonmucoid PA colony from each infected patient for molecular typing by pulsed-field gel electrophoresis. Pulsed-field-gel electrophoresis was used to identify AES-1. Data analysis. Griffiths 2005:	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens Prevalence of PA epidemic strain AES-1 among sputum producers: post-intervention (N=149, 2002 data): 0.27 vs pre-intervention (N=153, 1999 data): 0.44. Adjusted relative risk (aRR): 0.64 (95% CI 0.47 to 0.87), P=0.004 (adjusted for age and sex)	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (Intervention and comparison groups from different years, and not the closest full years to the intervention as in other studies) Comparability: Low risk (In Griffiths 2005 authors adjust for age and sex when comparing prevalence values for 1999 and 2002 and provide an adjusted relative risk) Outcome (prevalence amongst sputum

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out Australia Study type Griffiths 2005 Retrospective clinical audit (It is also a retrospective before and after study) Griffiths 2012 Retrospective before and after study Aim of the study Griffiths 2005 To determine whether strict infection control measures, including cohort segregation, interrupted cross-infection within the clinic. Griffiths 2012 To evaluate changes in prevalence of an epidemic strain of PA (AES-1, Australian			Relative risks comparing prevalence amongst sputum producers in 2002 with 1999 were adjusted for age and sex using binomial regression with a log-link function. Griffiths 2012: Prevalence amongst all patients attending was compared between 1999 and 2002. The difference in prevalence between different years was calculated. The 95% CI of the difference was estimated and statistical significance was assessed by Fisher's exact test.	Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	producers): Low risk (Although a limitation of the present study was testing only one to two sputum isolates of PA per sample from each infected patient, genotyping was used so that the prevalence of epidemic strains could be reported, separate from the prevalence of nonepidemic strains) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
epidemic strain, type 1) in a paediatric CF centre practising cohort segregation, to describe the clinical characteristics at acquisition and observe mortality rates Study dates Griffiths 2005 Not reported Griffiths 2012 Not reported Source of funding Griffiths 2005 Supported by the Royal Children's Hospital CF Research Trust Griffiths 2012 The Royal Children's CF Research Trust funded DFW in 2008					
Full citation	Sample size Not reported	Interventions	Details	Results	Limitations

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Chen, J. S., Witzmann, K. A., Spilker, T., Fink, R. J., LiPuma, J. J., Endemicity and inter-city spread of Burkholderia cepacia genomovar III in cystic fibrosis, Journal of Pediatrics, 139, 643-9, 2001 Ref Id 367474 Country/ies where the study was carried out USA Study type Retrospective before and after study Aim of the study To determine whether the same Burkholderia cepacia complex strain has persisted as the	Characteristics Patients with CF at two centres. Age or sex not reported. Inclusion criteria All patients cared for in Centre A and Centre B. Exclusion criteria Not reported	Intervention 2: Individual segregation in addition to cohort segregation. Hospitalized non-colonized patients were prohibited from sharing rooms, then this policy was expanded so that all patients with CF irrespective of B cepacia colonization were in separate rooms. Separate waiting rooms were established for outpatients. Intervention 1. Cohort segregation. Cohorting of hospitalized patients with CF on the basis of B. cepacia colonization status. Comparison 1: No cohort segregation. No details. Intervention 3: Cohort segregation combined with individual segregation and with protective equipment. · Cohorting of hospitalized patients on the basis of B. cepacia colonization status. Furthermore inpatients colonized with B. cepacia were placed in contact isolation and were required to wear mask and gloves when out of their rooms. In the outpatient setting, patients infected with B. cepacia were	Setting. Intervention 1 and 2 were implemented in Centre A (large CF treatment centre in Philadelphia) in early 1990 and mid-1996 to 1998, respectively. Intervention 3 was implemented in Centre B (CF treatment centre in Washington DC) in early 1997. Data collection. All available B cepacia complex isolates from 1981 to 1987 and from 1997 to 2000 at Centre A and from 1997 to 2000 at Centre B were recovered from frozen stock. In Centre A, sputum cultures were obtained from most patients only once per year. Sputum cultures were obtained 4 to 6 times per year from patients at Centre B. Infection control policies governing B cepacia infection in patients with CF were reviewed in Centers A and B for relevant years. Data analysis. All isolates were analyzed by PCR. The incidence and prevalence of B cepacia complex infection for Centre A and Centre B were calculated for relevant years baed on the total number of patients with CF	Incidence of patients infected with transmissible pathogens Annual incidence of B. cepacia complex infection at 1 year: Post-intervention 1: 3.7% (1991 data) vs Comparison 1: 5.8% (1989 data) Annual incidence of B. cepacia complex infection (unclear follow-up): Post-intervention 3: <1% (since time of implementation) vs usual care: 8.8% (1996 data) Prevalence of patients infected with transmissible pathogens Prevalence of B. cepacia complex infection: Post-intervention 2: 7% (1999 data) vs post-intervention 1: 15% (1992 data) Quality of life Not reported Emotional function including anxiety	The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection, intervention 1 vs comparison 1: High risk (Intervention and comparison groups were drawn from different years (1991 and 1989) however these are the closest pre- and post-intervention years. There is uncertainty about the infection status of patients in-between cultures which means that some supposedly "at risk" patients may have had the infection when the intervention started, especially considering that at centre A cultures were performed for most patients only once a year) Selection, intervention 3 vs usual care: Unclear (Intervention and comparison groups

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dominant clonal lineage among patients in a large CF treatment centre during two decades prior to the study. To investigate the inter-city spread of B cepacia through transfer of a colonized patient and the impact of infection control measures in contraining inter-patient transmission. Study dates Not reported Source of funding Supported by a grant from the CF Foundation (to Dr LiPuma).		restricted to separate clinic days during which no non-colonized patients were seen. Patients were required to wear masks while in the waiting room. A hospital-wide educational program regarding infection control measures was introduced Particular attention was given to disinfection of clinic rooms and equipment Comparison 3: Usual care No details	being cared for in the respective centre and the number reported by the respective clincal microbiology laboratory to have had at least one sputum culture positive for B cepacia.	and depression (scale not specified) Not reported Patient satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	were drawn from different years, however years of post-intervention incidence are unclear; uncertainty of infection status (relating to time in-between cultures) is limited because cultures were obtained between 4 and 6 times a year at centre B). Selection, intervention 2 vs intervention 1: High risk (Intervention and comparison groups were drawn from different years distant in time, 1999 and 1992; there is uncertainty about the infection status of patients in-between cultures which means that some supposedly uninfected patients may have already had the infection when the intervention started, especially considering that at centre A cultures were performed for

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					most patients only once a year) Comparability: High risk (Study does not control for any factor, only descriptive data are provided). Outcome: High risk (Although genotyping was used, so that authors could show that most patients were infected with the same B cepacia genomovar III strain in both centres, the following limitations were identified: the authors analysed isolates of most patients with CF reported to have had at least one sputum culture positive for B cepacia complex and found that some pathogens had been misidentified by routine analysis and were not B cepacia complex pathogens (however they would have been counted to calculate incidence/prevalence of B. cepacia complex). This

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					problem affects all outcomes and all comparisons in the study. Moreover, with regards to comparisons relating to centre A (intervention 2 vs intervention 1, and intervention 1 vs comparison 1), cultures where performed only once a year). Other information
Full citation Savant, A. P., O'Malley, C., Bichl, S., McColley, S. A., Improved patient safety through reduced airway infection rates in a paediatric cystic fibrosis programme after a quality improvement effort to enhance infection prevention and control measures, BMJ	Sample size N= Number of patients ranged from 126 to 177 over the study years. 127 patients with cultures in 2005 at the start of the baseline monitoring period. 75 of those patients continued to be followed in the programme in 2012. Mean number of respiratory tract cultures per quarter was 169 (range 104-207 in baseline period, 173-206 in postintervention). Characteristics	Interventions Intervention: Protective equipment and individual segregation Contact precautions for all patients in the outpatient clinic, regardless of respiratory tract culture results: gowning and gloving and hand hygiene by all providers; requesting that all patients use hand gel and mask when entering the facility or when outside of the exam room Abolishing the designated communal area for taking vital sign measurements and converting to exam rooms. Re-enforcement of the "no-waiting" room policy (Immediate	Details Setting. Paediatric CF programme at Ann & Robert H. Lurie Children's Hospital of Chicago. The intervention started late in quarter 4 of 2007. Data collection. Data from 2005 to 2012 was evaluated. Data analysis. Using a before and after evaluation, data from baseline were compared to post-intervention rates. Respiratory tract culture results were tracked using a customised report from the CFF registry. At the end of each quarter, the % of patients with a positive respiratory tract culture for	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens Mean % patients cultured each quarter with positive tract cultures for PsA: post initiation (2008-2012): 21.78% (range 31.09-12.95%) vs pre-intervention (2005-2007):	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (intervention and comparison groups drawn from different years, 2008-2012 vs 2005-2007) Comparability: High risk (Study does not adjust comparison for any factor) Outcome: High risk (No genotyping was used to assess whether acquisition

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Quality & Safety, 23, i73-i80, 2014 Ref Id 406470 Country/ies where the study was carried out USA Study type Retrospective before and after study Aim of the study To assess a quality improvement effort to reduce the risk of pathogen transmission between patients with CF and decrease the rate of acquisition of new CF pathogens. Study dates Data from 2005 to 2012 was evaluated Source of funding	Paediatric patients with CF. Age: Mean age (SD) ranged between 9.7 (5.9) and 10.6 (5.7) over the study years. (Age range was 0-21). Sex: % females ranged between 50 and 55 over the study years. Inclusion criteria All respiratory tract cultures of paediatric patients in CF programme at Ann & Robert Lurie Children's Hospital of Chicago Exclusion criteria Not reported	placement within the examination room) Education of patients and families; cleaning rooms thoroughly. Comparison: Incomplete use of protective equipment and incomplete individual separation Any patient with respiratory tract cultures revealing a multi-resistant pathogen had a flag placed on the chart to indicate the need for contact precautions. However a consistent process for the use of this indicator was not systematic or routine. Vital signs were performed in a common station in the hallway close to the exam rooms, without specific cleaning between patients. “No-waiting” room policy	a specific pathogen was defined as number of patients with a pathogen in one or more respiratory tract culture specimens divided by the total number of patients who had cultures (thus each positive respiratory tract culture for a specific pathogen only counted once per patient). A comparison between proportions was done using Student t tests. Moreover, % of patients per year with respiratory tract cultures for 2005-2007 was compared to 2008-2011 using data from the CF Patient Registry.	29.79% (range 38.74-22.94%) (p<0.0001). Mean % patients cultured each quarter with positive tract cultures for MRSA: post (2008-2012): 8.68% (range 12.78-5.38%) vs pre-intervention (2005-2007): 10.76% (range 12.5-7.34) (p=0.008). Mean % patients per year with culture positive for PsA: 2008-2011 13.95% vs 2005-2007 13.5% (data from CF Patient Registry) Mean % patients per year with culture positive for MRSA: 2008-2011 24.5% vs 2005-2007 19.1% (data from CF Patient Registry) Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported	of infection was related to cross-infection. However please note the following strengths: Follow-up of 4 years was long enough to detect changes; Uncertainty about infection status of patients in-between cultures is limited because cultures were obtained each quarter) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
None				Patient satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	
Full citation Whiteford, M. L., Wilkinson, J. D., McColl, J. H., Conlon, F. M., Michie, J. R., Evans, T. J., Paton, J. Y., Outcome of Burkholderia (Pseudomonas) cepacia colonisation in children with cystic fibrosis following a hospital outbreak, Thorax, 50, 1194-8, 1995 Ref Id 426761 Country/ies where the study was carried out UK	Sample size N=115 (1992). Characteristics Children with CF. Mean age: 7.6 years. Age range: 0.6 to 15.8 years. 1 patient was already colonised with B cepacia by December 1991. Inclusion criteria Patients attending the CF Unit at the Royal Hospital for Sick Children, Glasgow. Exclusion criteria Not reported	Interventions Intervention. Cohort segregation Children with B. cepacia were admitted to a separate ward Children with B. cepacia were moved to a different waiting area and given appointment times at the end of the clinic. Recommendations to parents to avoid close physical contact outside the hospital Comparison. No cohort segregation No cohort segregation for children with B. cepacia Children with CF needing inpatient care were admitted to one ward where they had complete freedom to play together and socialise Each child had an individual peak flow meter and nebuliser for use throughout the admission Children colonised with PA had their chest physiotherapy	Details Setting. The CF Unit at the Royal Hospital for Sick Children, Glasgow. The intervention was implemented in June 1992. Data collection. Specimens for bacterial culture were either sputum samples or cough swabs in those unable to produce sputum. Bacteriocin typing of all B. cepacia organisms was performed by standard methods. Data analysis. The number of new cases of B. cepacia colonisation, disaggregated by bacteriocin type, were presented for each month of 1992.	Results Incidence of patients infected with transmissible pathogens New cases of B. cepacia / all children with CF at risk: post-intervention (Dec 1992): 1/93 vs vs pre-intervention (May 1992): 5/109 Prevalence of patients infected with transmissible pathogens Not reported Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: Unclear (Authors do not mention how often cultures were obtained, therefore it is not clear how much uncertainty there is in the calculation of the number of people "at risk" for each month; intervention and comparison group drawn from different months in the same year, therefore there is no reason to assume they would be very different; all children attending the CF Unit were

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study type Retrospective before and after study with regards to the outcomes of interest. Aim of the study To compare the outcomes of children with CF colonised with B. cepacia and PA to children with CF with PA but no B.cepacia. Study dates Not reported Source of funding Not reported		separately from children without PA		Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	included in the analysis) Comparability: High risk (study does not adjust for any factor, only descriptive data relating to incidence pre- and post-intervention) Outcome: High risk (No genotyping was used to understand whether new cases were related to cross-infection, although bacteriocin typing was performed by standard methods. Authors do not specify how often cultures were obtained, therefore, it is unclear whether the follow-up was long enough to see a change in incidence) Other information
Full citation Jones, A. M., Dodd, M. E., Govan, J. R., Doherty, C. J., Smith, C. M., Isalska, B. J., Webb, A. K., Prospective	Sample size N= 216 (1999), 221 (2000), 228 (2001) Characteristics Adults with CF. Age not reported, sex not reported. Inclusion criteria	Interventions Intervention 1: Incomplete cohort segregation. Patients without chronic PA infection attended outpatient clinic appointments on a different day than other patients with CF.	Details Setting. Manchester CF Adult Centre. Intervention implemented in 2000. Data Collection. Over a 4-year period (2000-2003), PA isolates were prospectively typed from patients with CF. PA isolates were	Results Incidence of patients infected with transmissible pathogens Not reported for all relevant years	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: Low risk (Intervention and

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
surveillance for Pseudomonas aeruginosa cross-infection at a cystic fibrosis center, American Journal of Respiratory & Critical Care Medicine, 171, 257-60, 2005 Ref Id 367609 Country/ies where the study was carried out UK Study type Retrospective before and after study. Aim of the study To assess clonality of strains amongst patients with CF attending the Manchester Adult CF Centre. Study dates 2000-2003 Source of funding	Patients with CF who attend the Manchester Adult Centre. Exclusion criteria One patient with a different transmissible PA strain transferred in late 2003 from another adult centre.	Inpatients without chronic PA infection were housed on the same CF ward as patients with chronic PA infection, but in rooms with en-suite facilities, and were advised not to socialise with other patients on the ward, however there was still some social mixing between patients on the ward. Comparison: No segregation. Purpose-built facilities: all inpatients had their own bedroom, although only 2 of 11 rooms had en-suite facilities. Treatments with door closed Practice of strict hygiene. Rooms are cleaned between patients, equipment not shared between patients, hand hygiene for staff.	retyped more frequently if they displayed unusual phenotypic features. In addition patients with multiple inpatient admissions or patients found to have been exposed to potential risk of cross-infection, e.g. through social contact, where retyped more frequently. Data analysis. Chronic PA infection was defined as the regular culture of the organism from the sputum or respiratory secretions, on two or more occasions extending over 6 months.	Prevalence of patients infected with transmissible pathogens Total number of patients with chronic PA infection/total number of patients: post-intervention: 184/228 (2001 data) vs comparison: 156/216 (1999 data) Patients chronically infected with transmissible PA strain infections/total number of patients: post-intervention 35/228 (2001 data) vs comparison: 28/216 (1999 data) Prevalence of infection with transmissible PA strains: post-intervention: 15.4% (2001 data) vs comparison: 13.0% (1999 data) Quality of life Not reported Emotional function including anxiety and depression (scale not specified)	comparison group drawn from different years, 1999 and 2001, however these are the closest pre- and post-intervention full years. All patients attending the centre were included) Comparability: High risk (Study does not adjust for any factor, only descriptive summary of outcomes for pre- and post-intervention) Outcomes: Low risk (Isolates were genotyped by pulsed-field gel electrophoresis to identify transmissible strains. However please note that authors do not report how often cultures were performed, only report that PA isolates were retyped more frequently if they displayed unusual phenotypic features. In addition patients with multiple inpatient admissions

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Not reported				Not reported Patient satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	or patients found to have been exposed to potential risk of cross-infection where retyped more frequently) Other information Authors mention that the new cases of transmissible PA infection since 2000 are cases of super-infection among patients already infected with sporadic strains of PA. The latter were not segregated from the former. As a consequence of the results of the study all inpatients were required to remain in their own rooms at all times and not to mix with other patients irrespective of their microbiological status.
Full citation Hayes, D., Jr., West, S. E., Rock, M. J., Li, Z., Splaingard, M. L., Farrell, P. M.,	Sample size N= 39 infants and children with CF (21 in intervention group, 18 in comparison group) Characteristics	Interventions Intervention. Cohort segregation: Segregated clinics (free of patients with PsA). The segregated clinics were held on a separate day in the same clinic space used for mixed clinics;	Details Study setting. University of Wisconsin Hospital and Clinics in Madison, WI and Children's Hospital of Wisconsin in Milwaukee, WI. Data collection. A	Results Incidence of patients infected with transmissible pathogens Incidence of PA infection over 10	Limitations The quality of this trial was assessed using the Cochrane risk of bias assessment tool:

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Pseudomonas aeruginosa in children with cystic fibrosis diagnosed through newborn screening: assessment of clinic exposures and microbial genotypes, Pediatric Pulmonology, 45, 708-16, 2010 Ref Id 367574 Country/ies where the study was carried out United States Study type Randomized clinical trial of two clinic types (subjects randomized to either segregated clinics or mixed clinics) with enrollment, longitudinal cohort follow-up observation	Infants and children with CF. Age: not reported Sex: Intervention: 9 females (43%), 12 males (57%) vs comparison: 7 females (39%), 11 males (61%) Inclusion criteria Positive newborn screen; informed consent provided by parents or legal guardians. Exclusion criteria Not reported	large clinics and waiting rooms, and hygienic precautions. Comparison. No cohort segregation: Mixed clinics that included PsA positive patients; large clinics and waiting rooms, and hygienic precautions.	cotton-tipped swab was used to collect the specimen from the oropharynx at each clinic visit using standardized methods previously employed at each CF center. Confirmation of PA was performed by standard biochemical testing. Arbitrarily primed polymerase chain reaction (AP-PCR) was used for genetic analysis. Data analysis. The incidence over 10 years was calculated for each group.	years: Intervention: 13/21 vs Comparison: 14/18. Prevalence of patients infected with transmissible pathogens Not reported Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	Random sequence generation: Unclear risk of bias (authors do not describe how the allocation sequence was generated). Allocation concealment: Unclear risk of bias (authors do not describe whether any method was used to conceal the allocation sequence). Blinding: Unclear risk of bias (Blinding is not mentioned. It may not be possible with this intervention). Incomplete outcome data: Unclear risk of bias (no attrition; authors do not mention how many children did not fit the study's inclusion criteria). Selective reporting: Unclear risk of bias (Authors do not mention the possibility of selective outcome reporting).

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
and data collection during approximately 10 years. Randomization in 1996 occurred between two centres, but due to an IRB requirement during the reapproval process after one year, the assignments changed to within-centre randomization for 1997-2001. Aim of the study The project was designed to address several goals: To compare PsA acquisition in segregated and mixed clinics; To compare PsA acquisition in a new clinic with adequate hygiene precautions					Other bias: Low risk of bias (None identified) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
versus the small, old clinic in Miwaukee; To examine PsA isolates through genotyping for patterns that might imply cross-infection. Study dates 1996-2005 Source of funding The National Institutes of Health (grant NIDDK 5 R01 DK34108-17)					
Full citation Thomassen, M. J., Demko, C. A., Doershuk, C. F., Stern, R. C., Klinger, J. D., Pseudomonas cepacia: decrease in colonization in patients with cystic fibrosis, American Review of Respiratory	Sample size N= 389 (admissions post-segregation); 453 (admissions pre-segregation); Characteristics Paediatric patients with CF. Age: not reported Inclusion criteria Inpatients and outpatients at the Rainbow Babies and Children's Hospital. Exclusion criteria	Interventions Intervention: Incomplete cohort segregation All patients with Pseudonomas cepacia recovered from sputum or throat culture were admitted to one floor of the hospital - other patients with CF were not admitted to this floor. Siblings of patients with P. cepacia colonization were also admitted to this ward The patients on this ward were not permitted to visit other inpatient wards but were not isolated in any other way. They	Details Setting. Rainbow Babies and Children's Hospital. Intervention was introduced in August 1983. Data collection. Sputum or deep throat cultures after cough were obtained at admission and weekly thereafter for inpatients. Strains of P. cepacia were serotyped. Data analysis. To investigate possible modes of transmission, patient-to-patient contact was examined. Hospital-	Results Incidence of patients infected with transmissible pathogens Incidence (Number of patients with hospital-associated colonization/at-risk patients): Post-intervention: 2.6% (6/235) vs pre-intervention: 7.8% (24/308), OR (pre vs post)=3.1, p=0.012	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: Low risk (Cultures from all admitted patients were included; intervention and comparison groups were drawn from two different time periods however these time intervals were

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Disease, 134, 669-71, 1986 Ref Id 332134 Country/ies where the study was carried out USA Study type Retrospective before and after study Aim of the study To compare colonization patterns after precautionary measures were instituted to the patterns before the measures were introduced. Study dates Not reported Source of funding Supported by Public Health Service Grant AM-27651 from the National Institutes of Health and by grants from the	Not reported	had free access to the elevators, hospital cafeteria, and other common areas. No special precautions were taken to totally avoid chance meetings of the 2 groups of patients in the radiology department, outpatient areas, pulmonary function laboratory, or other hospital areas. Equipment in pulmonary function lab was sterilized or changed between patients. Hand washing was emphasized. In some cases medical staff advised patients to avoid out-of-hospital contact with colonized patients. Masks or other isolation equipment were not used by patients or hospital personnel. Summer camp facility was reserved for patients free of P. cepacia, another camp site was provided for colonized patients. Comparison: No cohort segregation in hospital Basic infection control procedures (no details) No segregation in camp facility	associated colonization was considered if a patient's first positive culture occurred 10 or more days after admission. This was generally the patient's third culture since admission. This interval was chosen to account for patients colonized with P. cepacia at subdetectable amounts prior to hospitalization. Patients hospitalized within 3 months prior to colonization were also considered to have a hospital-associated acquisition. Patients with a positive culture prior to 10 days after admission were considered precolonised. The number of patients who were precolonised was subtracted from the number of admissions to calculate the number of patients at risk. Incidence of hospital-associated colonization was calculated for 1 year and 5 months before the intervention (1 Mar 1982- 31 Jul 1983) and 1 year and 5 months afterwards (1 Aug 1983- 31 Dec 1984). Chi-square analysis of the 2x2 contingency table was	Prevalence of patients infected with transmissible pathogens Not reported Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported	reasonably close: the pre- intervention interval was 1 Mar 1982- 31 Jul 1983 and the post-intervention interval was 1 Aug 1983- 31 Dec 1984; authors made sure that the outcome of interest was not present in the group considered "at risk" by defining hospital-associated colonization as an infection that showed for the first time in a positive culture 10 or more days after admission. This interval was chosen to account for patients colonized with P. cepacia at subdetectable amounts prior to hospitalization) Comparability: High risk (Study does not control for any factor) Outcome: High risk (There was an attempt to assess the relationship between incidence and cross-infection because serotyping was used

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
CF Foundation, the C.H. Ivey Foundation, and United Way Services of Cleveland.			performed and the OR was calculated.		to identify strains of P cepacia, patient-to-patient contact was examined and environmental reservoirs for P. cepacia were examined. However, no genotyping was used. Please note the following strength: Authors focused on incidence of hospital-associated colonization, which would be more closely related to cross-infection than overall incidence amongst all patients.) Other information
Full citation Lee, T. W., Brownlee, K. G., Denton, M., Littlewood, J. M., Conway, S. P., Reduction in prevalence of chronic Pseudomonas aeruginosa infection at a regional pediatric cystic	Sample size N=232 patients (76 in January 1990, 152 in December 2000); 17,230 patient months Characteristics Paediatric patients with CF. Mean age: 7.73 (January 1990), 9.42 (December 2000). Inclusion criteria All patients attending the clinic between	Interventions Intervention: Cohort segregation. Separate clinics for patients chronically infected with PA and uninfected patients. Improved hygienic measures in a purpose-built CF centre Comparison: No cohort segregation Various management strategies over the years to reduce the prevalence of chronic PA, including:	Details Setting. Leeds Regional CF Unit. Intervention implemented in 1991. Data collection. Patients had a sputum or cough swab sample taken at every clinic visit, with not more than 12 weeks between visits. Patients were defined each successive calendar month as: PA culture-positive; PA culture-negative; no culture	Results Incidence of patients infected with transmissible pathogens Graphic reporting, authors mention: "the annual incidence of new growths of PA, while fluctuating, showed no downward trend, despite segregation"	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (Intervention and comparison groups drawn from different and distant years, namely 1990 and 2000; the post-intervention group

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
fibrosis center, Pediatric Pulmonology, 37, 104-10, 2004 Ref Id 331318 Country/ies where the study was carried out UK Study type Retrospective before and after study Aim of the study To assess the impact of subsequent interventions implemented at Leeds Regional CF Unit over the years on reducing the prevalence of PA infection, including separate clinics for patients chronically infected with PA and uninfected	January 1990 and December 2000. Exclusion criteria Not reported	Neonatal screening (1975) Regular microbiological monitoring (1975) Early antibiotic treatment of first isolations of PA (1985) Intensive iv antibiotic treatment where nebulized antibiotics failed to eradicate PA (1988)	performed. All patients in the clinic were categorized each successive month according to their PA culture status over the preceding 12 months on the following basis: Chronic: chronic PA infection, with more than 50% of months when samples had been taken being PA culture-positive. Intermittent: 50% or less of months when samples had been taken being PA culture-positive. Free: Free of PA with no growth of PA for the previous 12 months, having previously been PA culture-positive. Never: Never grown PA. Data analysis. A monthly prevalence of "chronic", "intermittent", "free" and "never" status was calculated. Statistical analysis was performed, using a t-test for proportions.	Prevalence of patients infected with transmissible pathogens Yearly prevalence of chronic PA infection at 9 years: post-intervention (2000): 18.1% (326/1803 patient months) vs. pre-intervention (1990): 24.5% (237/966 patient months), P<0.05 Yearly prevalence of intermittent PA infection at 9 years: post-intervention (2000): 34.5% (622/1803 patient months) vs pre-intervention (1990): 26.2% (253/966 patient months), P<0.02 Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient satisfaction Not reported Staff experience	was not only exposed to segregation, but also to an additional intervention: in 1998 the duration of eradication therapy was increased to 3 months of oral ciprofloxacin and nebulized colomycin, and this change was associated with a further fall in the prevalence of PA infection; according to the authors, the rise in intermittent PA infection is probably due to the successful eradication of new PA infection) Comparability: High risk (Study does not control for any factor; however please note that increase in average age of the clinic and in the mean culture frequency would both tend to bias towards an increase in diagnosis of chronic PA infection) Outcome: High risk (No genotyping was

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
patients in 1991. Study dates Not reported Source of funding Not reported				Not reported Staff and patient compliance Not reported	done to see if PA infections had been acquired through cross-infection; cultures were performed at least once every 12 weeks, however it is not clear if the denominator for prevalence (patient months) excludes patients that did not have a culture for a specific month) Other information
Full citation McKay, K. O., Cooper, P. J., van Asperen, P. P., Segregation of children with CF diagnosed via newborn screening and acquisition of Pseudomonas aeruginosa, Journal of Cystic Fibrosis, 8, 400-4, 2009 Ref Id 331487	Sample size N=Between 72 and 90 children were seen in each year of the study. The results of 2837 sputum cultures were analysed for the study. Characteristics Infants and children with CF. Age <=5. Sex: "There were equal numbers of male and female children in each group" Inclusion criteria All children aged <=5 for whom culture results	Interventions Intervention: Cohort segregation by age. Outpatients clinics were designated by colour as "red" (children 5 and under who were PA-free), "blue" (primary school age or children under 5 already colonised with PA) or "green" (secondary school age). Additional infection measures (e.g. removal of toys from the waiting room and hand cleansing). All inpatients were treated in single rooms or in rooms shared with children without CF.	Details Setting. Segregation policy was introduced in the hospital April and May 2003 and outcome data are provided for 1999-2002 vs 2004-2007. Data collection. Culture results were obtained between 1999-2002 and 2004-2007. Mean+-SE of sputum cultures analysed each year for each child: post-intervention: 4.63+-0.07 (median=4) and pre-intervention: 4.53+-0.08 (median=4). All cultures performed from 1st January to 31st December	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens 4-year prevalence of MRSA at 1-4 years: Post-intervention (2004-2007): 1.0% vs pre-intervention (1999-2002): 1.3%, P= ns	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (Adherence to the "coloured" clinic booking scheme was high, ranging between 94.4% and 97.5%, however not complete, so that some people who were supposed to be in the intervention group may have not been in the

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out Australia Study type Retrospective before and after study Aim of the study To investigate the effect of segregation on acquisition of respiratory pathogens Study dates Not reported Source of funding Not reported	were obtained between 1999-2002 and 2004-2007. Exclusion criteria Not reported	Comparison: No cohort segregation One all age (0-18) clinic Free mixing of patients in waiting area	each year were included for that year's results. Few of the children were able to successfully expectorate so sputum samples were collected by experienced nurses using a deep pharyngeal suction technique. Data analysis. Prevalence was defined as the percentage of children isolating the organism in question at least once during the relevant period (pre-intervention or post-intervention). Comparison of rates of infection before and after the introduction of segregation was done using Chi-square analysis.	4-year prevalence of non-mucoid PA at 1-4 years: Post-intervention (2004-2007): 22.7% vs pre-intervention (1999-2002): 22.3%, P= ns 4-year prevalence of mucoid PA at 1-4 years: Post-intervention (2004-2007): 1.0% vs pre-intervention (1999-2002): 5.9%, P<=0.001 Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported Patient and carer satisfaction Not reported Staff experience Not reported Staff and patient compliance Adherence to the "coloured" clinic booking scheme: % of children attending the red clinic who were 5 and under:	intervention group in practice. Intervention and comparison groups were drawn from different time intervals, 1999-2002 and 2004-2007. However, authors mention that the use of antibiotics did not change significantly after segregation. Similarly there were no changes in respiratory consultants) Comparability: High risk (Study does not control for any factor) Outcome: High risk (Although the frequency of at least 4 cultures per child per year would be sufficient to assess prevalence over 4 years, no genomic fingerprinting was carried out to see if prevalence was related to cross-infection. Moreover, authors mention that while deep suction via the oropharynx was used in the study to obtain

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
				2004: 96.8%; 2005: 97.5%; 2006: 94.4%; 2007: 95.9%	sputum samples rather than oropharyngeal swabs for microbiological culture, such specimens do not always predict the presence of bacterial pathogens, particularly PA, in the lower airways of young children with CF.) Other information
Full citation Russo, K., Donnelly, M., Reid, A. J., Segregation--the perspectives of young patients and their parents, Journal of Cystic Fibrosis, 5, 93-9, 2006 Ref Id 367784 Country/ies where the study was carried out UK Study type	Sample size N= 192 parents, 101 patients. Characteristics Mean age of eligible patients: 13 (range 10-17). Sex:Male to female ratio: 49:52. Infection status of patients: 13 did not have an infection, 2 had an unknown status, 47 cultured one organism, 34 cultured two organisms, 5 cultured three or more organisms. Inclusion criteria	Interventions Intervention: individual segregation. Policy of segregation requiring all patients to remain in their individual rooms for the duration of their hospital stay Comparison: Usual care	Details Setting. Belfast Paediatric CF centre. In mid-2004 views were elicited in preparation for the process of implementing the intervention. Data collection. Semi-structured questionnaires were anonymous and included both open-ended and closed-ended questions. Two versions of the questionnaire were devised - a child friendly version and a version for parents/carers. A pilot exercise was undertaken to test the relevance and acceptability of the child and parent questionnaire,	Results Incidence of patients infected with transmissible pathogens Not reported Prevalence of patients infected with transmissible pathogens Not reported Quality of life Not reported Emotional function including anxiety and depression (scale not specified) Not reported	Limitations The quality of this study was assessed using the Newcastle-Ottawa scale assessment tool: Selection: High risk (43% of parents and 23% of children returned questionnaires. The authors mention that the main limitation of this study is the low response rate, particularly from patients. Comparability between respondents and non-respondents was assessed for

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Survey with questionnaire including closed-ended and open-ended questions Aim of the study To elicit patients and carers' views and to involve them in the process of introducing segregation in a paediatric CF centre Study dates Mid-2004 Source of funding The study was partly supported by the Belfast Royal Group of Hospitals Multidisciplinary Research Fellowship.	All parents and patients over 10 years cared for by the Belfast Paediatric CF centre. Questionnaires received within 2 months from initial posting were included in the analysis. Exclusion criteria Not reported		respectively, as well as the data collection procedures. Questionnaires were mailed along with a covering note and an information sheet. A reminder letter was posted after three weeks. Data analysis. A content analysis identified common themes. The percentage of parents and children who supported segregated treatment was calculated. A chi-squared analysis and a logistic regression analysis were undertaken to investigate systematic differences between respondents and non-respondents.	Patient and carer satisfaction % of parents who supported segregated treatment: 91%. N of parents who disagreed: 4. N of parents who were unsure: 3 % of children who supported segregated treatment: 92%. N of children who disagreed though their parents agreed with the policy: 1. N of children who were unsure though their parents agreed with the policy: 1 Staff experience Not reported Staff and patient compliance Not reported	parents, indicating that more parents of younger children than of older children tended to respond (p=0.01). The relatively small number of child respondents did not permit a meaningful statistical comparison). Comparability: High risk (The study does not control for any factor) Outcome: High risk (Self-report, questionnaires had been tested in a pilot exercise) Other information
Full citation Hoiby, N., Pedersen, S.	Sample size N= Range: 54-226 (between 1970 and	Interventions	Details Setting. Danish CF centre at Rigshospitalet,	Results Incidence of patients infected	Limitations The quality of this study was assessed

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
S., Estimated risk of cross-infection with Pseudomonas aeruginosa in Danish cystic fibrosis patients, Acta Paediatrica Scandinavica, 78, 395-404, 1989 Ref Id 451979 Country/ies where the study was carried out Denmark Study type Retrospective before and after study Aim of the study To further analyse data on PA cross-infection at the Danish CF Centre and to try to estimate the risk of cross-infection in various periods of time in the Centre.	1987). Subgroup of patients with PA infection in 1983, segregated between patients with multiply resistant PA and patients with sensitive strain of PA: N=119 Characteristics People with CF Age: Not reported Sex: Not reported Inclusion criteria Patients attending the CF centre at Rigshospitalet in Copenhagen. Exclusion criteria Not reported	Intervention 2: Cohort segregation of patients with multiply resistant PA strain Three groups: Patients with multiply resistant PA strain; cohort with normally sensitive strains of chronic PA infection; PA negative patients Improved hygienic precautions Intervention 1. No cohort segregation of patients with multiply resistant PA strain (although there was segregation of PA positive patients - same intervention and setting (i.e. same population) as in the Frederiksen 1999 study) Two cohorts, cohort with chronic PA infection separated from PA negative patients Segregated from each other in different wards and seen on different days in the outpatient clinic.	Copenhagen. Intervention 2 was implemented in April 1983. Data Collection. Once a month patients are seen at the outpatient clinic, the examinations include microscopy and culture of bacteria and fungi from sputum or tracheal secretion obtained by endolaryngeal suction. Data analysis. Authors calculated incidence and prevalence. Incidence and prevalence of multiply-resistant PA was calculated using the number of PA positive patients as denominator.	with transmissible pathogens Incidence per month of multiply resistant strain (new patients with multiply resistant strain/patients with PA at risk): intervention 2: 6.5% (5/77) (May 1983) vs intervention 1: 20.6% (22/107) (March 1983) Prevalence of patients infected with transmissible pathogens Prevalence per month of multiply resistant strain (patients with multiply resistant strain/patients with PA): intervention 2: 37% (44/119)* (May 1983) vs intervention 1: 33% (39/119)* (March 1983) Quality of life Not reported Emotional function including anxiety and depression (scale not specified)	using the Newcastle-Ottawa scale assessment tool: Selection, intervention 2 vs intervention 1: Low risk (All patients with PA, comparison and intervention group drawn from different months of the same year) Comparability: High risk (Study does not adjust for any factor) Outcome: High risk (No genotyping was used to assess the relationship between incidence or prevalence and cross-infection. Please note that follow up (either 1 month or 2-4 years depending on the comparison) was long enough for changes to occur because culture of bacteria was obtained once a month) Other information

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study dates Not reported Source of funding Not reported				Not reported Patient satisfaction Not reported Staff experience Not reported Staff and patient compliance Not reported * Numerator calculated by the NGA technical team	