

Short time between shifts and risk of injury among Danish hospital workers

A register-based cohort study

Helena B Nielsen, Ann D Larsen, Johnny Dyreborg, Åse M Hansen,
Lisa A Pompeii, Sadie H Conway, Johnni Hansen, Henrik A Kolstad,
Kirsten Nabe-Nielsen, Anne H Garde

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Background

- Shift work is common and linked to sleepiness
- Sleepiness may be a mechanism between shift work and injury

Short time between shifts

- Less time for restitution
- “Quick returns” (≤ 11 hours between two shifts)
- Only few studies on quick returns and injuries

Aim of the study

To assess short time between two work shifts and risk of injury among Danish hospital workers

In specific:

- Time between shifts (1-17 hours)
- Quick returns (≤ 11 hours)
- Number of quick returns past week
- Days since a quick return

Study population

- Healthcare workers from the Danish Working Hour Database



- 76% women
- Mean age: 40 years old
- 63% had jobs with patient contact (eg. nurse)

Two regions (urban and rural)
N = 152 995 | PY = 682 068



First injury
N = 152 995 | PY = 521 570



18 – 65 years old, alive and in Denmark
N = 151 465 | PY = 508 999



Fulltime work and primarily employed by Region
N = 94 671 | PY = 300 926



Not first year
N = 74 961 | PY = 234 819



Total population
N = 69 200 | PY = 167 726

Exposures



Danish Working Hour Database

Start and end times of all shifts

- **Time between shifts** (1-17 hours)
Hours from end of one shift to beginning of next shift
- **Quick return** (≤ 11 hours)
 ≤ 11 hours between two shifts
- **Number of quick returns past week** (1-7 quick returns)
Quick returns the past week
- **Days since a quick return** (0-6 days since a quick return)
Days since a quick return, with no quick returns in between

Injuries

The National Patient Register

- Emergency department visits caused by accident

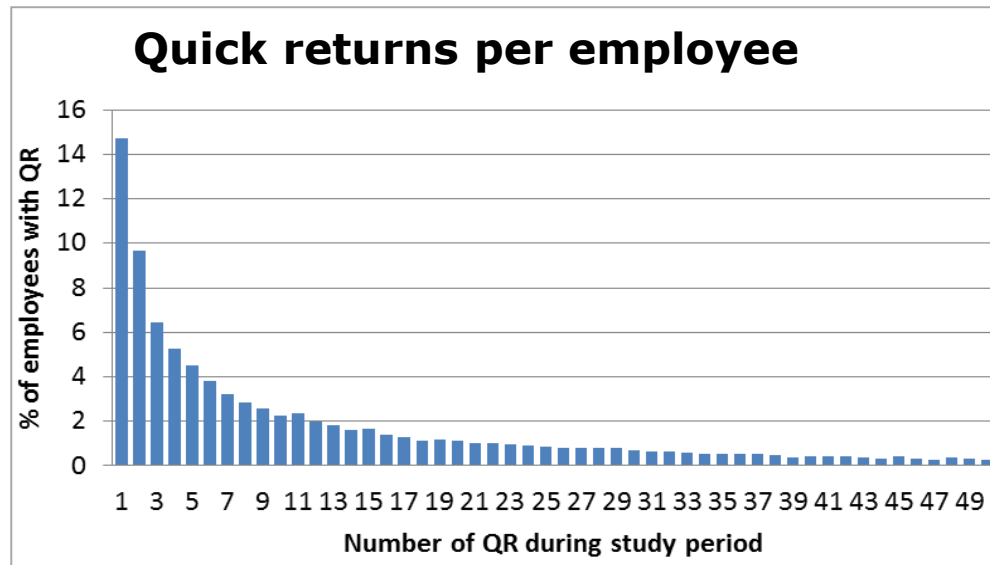
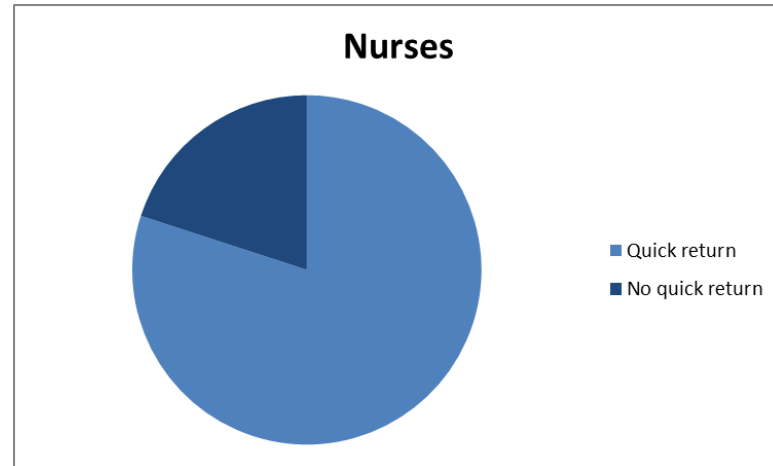
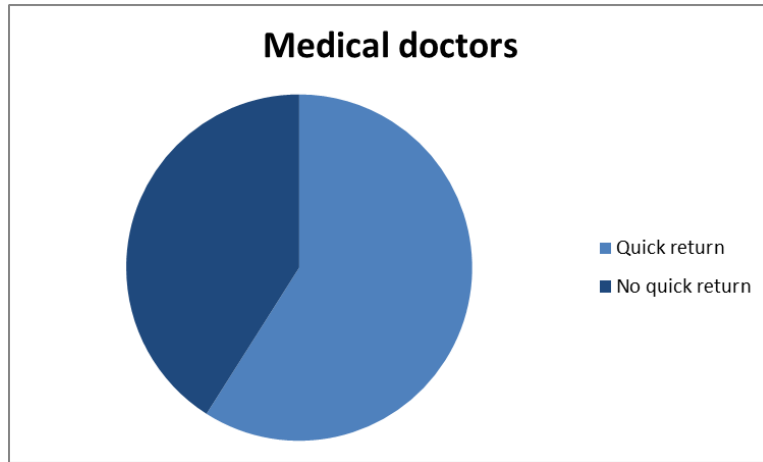
The Danish Register of Causes of Death

- Deaths cause by accidents

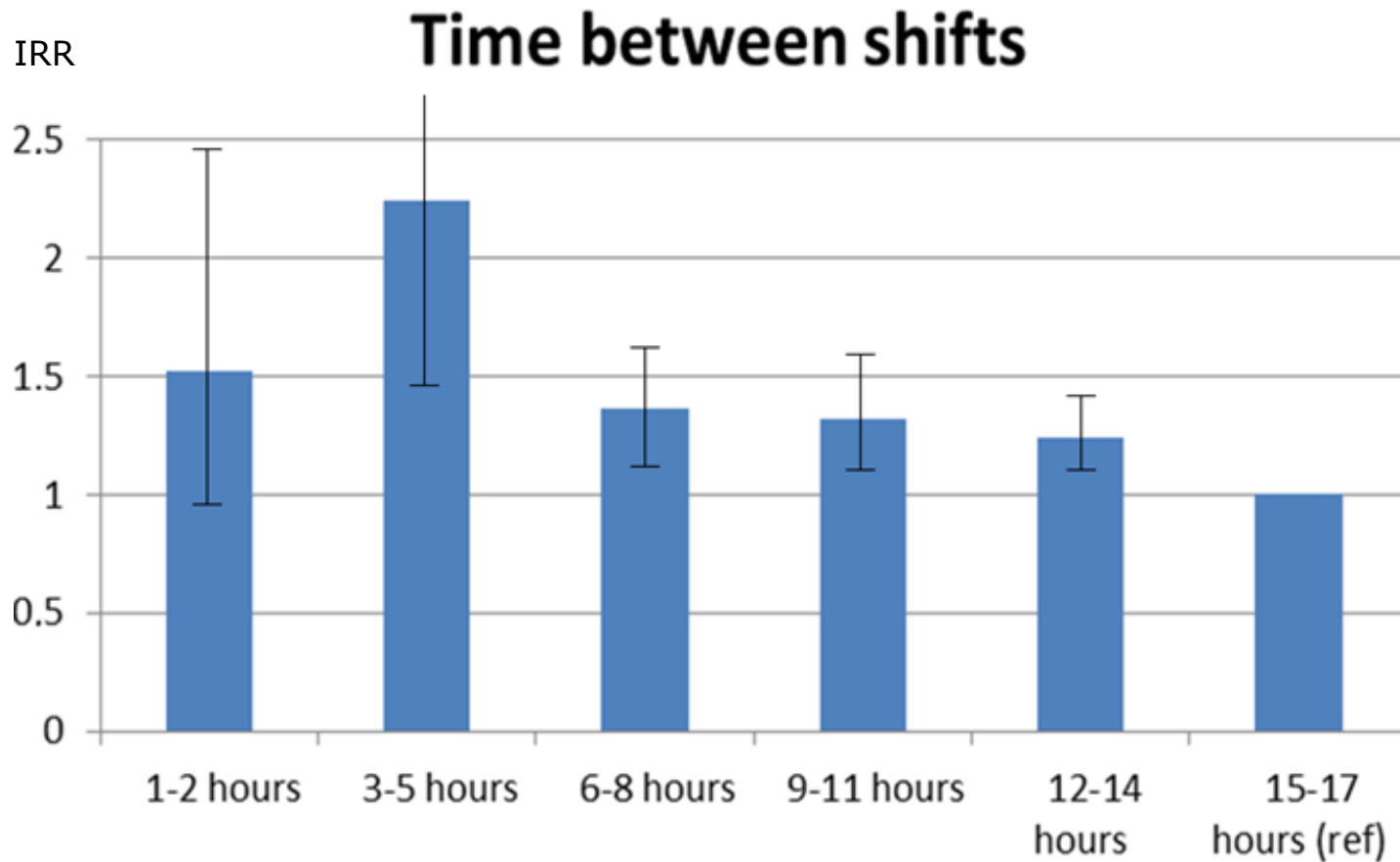
Analyses

Poisson regression analysis with Generalized Estimating Equations to account for repeated measures within employees

Employees with quick returns



Results



Adjusted for calendar year, season, age, sex, occupation

Results

- The more time between shifts the lower the risk of injury
- Risk of injury was 39% higher on days with a quick return (≤ 11 hours) compared with 15-17 hours (IRR 1.39, 1.23-1.58) between shifts
- Number of quick returns the past week was not associated with risk of injury
- Risk of injury was in particular high on the day and the day after a quick return

Strength and limitations

- Large study population
- Daily detailed register measures of exposure and outcome
- The exact time of injury is not known
- Unregistered overtime
- Additional confounding

Conclusion

- Quick returns are common – especially among nurses and doctors
- Risk of injury was higher after quick returns compared with 15-17 hours
- The shorter time between two shifts the higher the risk of injury
- Risk of injury was particular within the first two days following a quick return
- These findings point towards avoiding quick returns

Thank you

hbn@nfa.dk

Sensitivity analysis

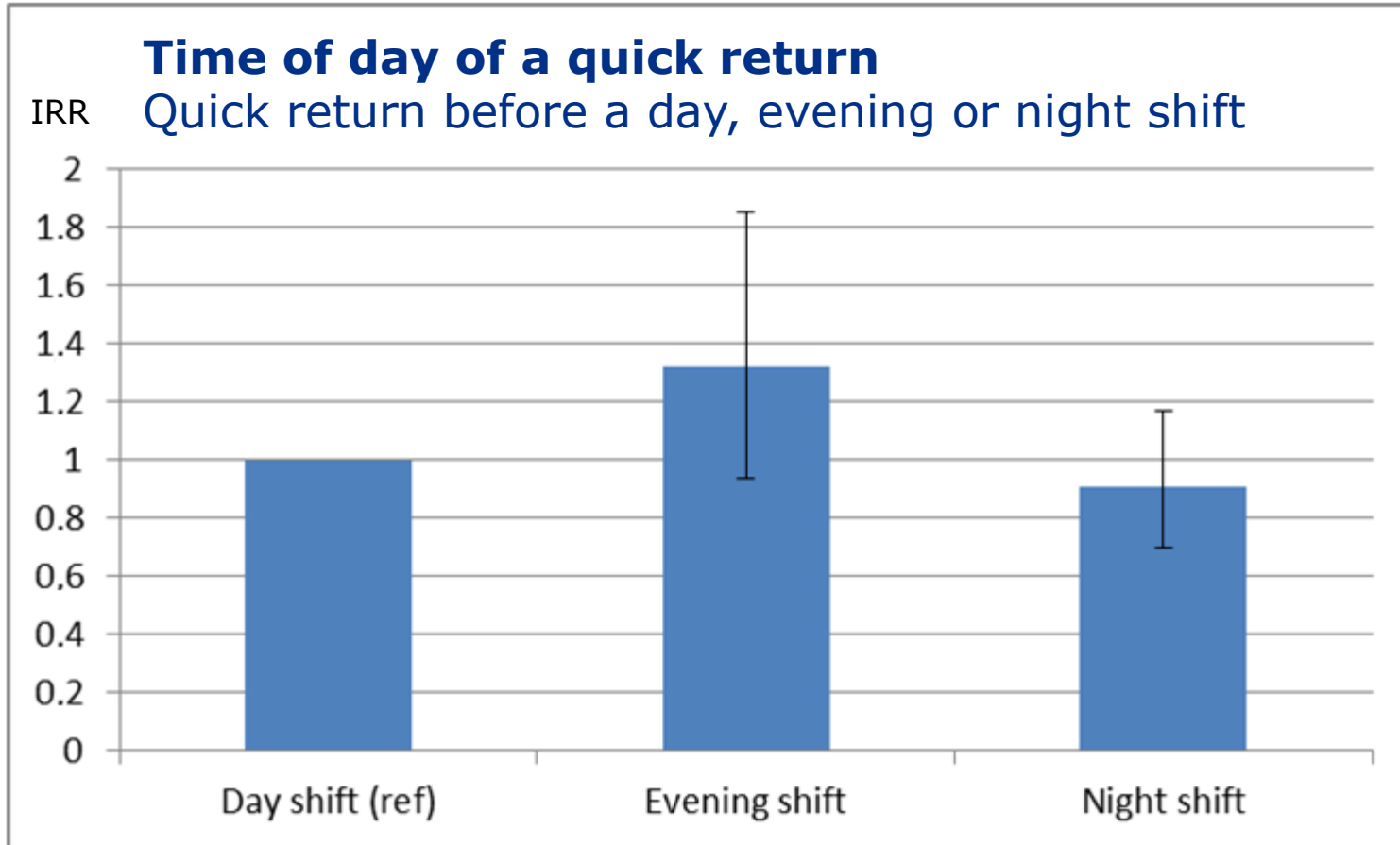
Employees with at least one quick return
the past year (N = 36 875)

	Injury cases	PY	Model 2: QR periods		
			IRR	95%CI	P-value
	n= 5387	PY= 65 979			
Time between shifts (hours)					
1-2	17	155	1.35	0.84-2.18	0.013
3-5	19	118	1.98	1.26-3.13	
6-8	116	1078	1.16	0.96-1.40	
9-11	107	1080	1.16	0.95-1.41	
12-14	163	1574	1.24	1.06-1.46	
15-17 (ref)	1766	20 431	1		
Continuous (1-17)			0.96	0.95-0.98	<0.001
Quick return (hours)					
15-17 (ref)	1766	20 431	1		0.009
≤11	259	2431	1.21	1.06-1.38	
Number of quick returns past week					
Continuous	1349	14 945	0.97	0.88-1.08	0.610
Days since quick return					
Continuous (0-6 days)	1349	14 945	0.97	0.94-1.00	0.027

Sensitivity analysis (continued)

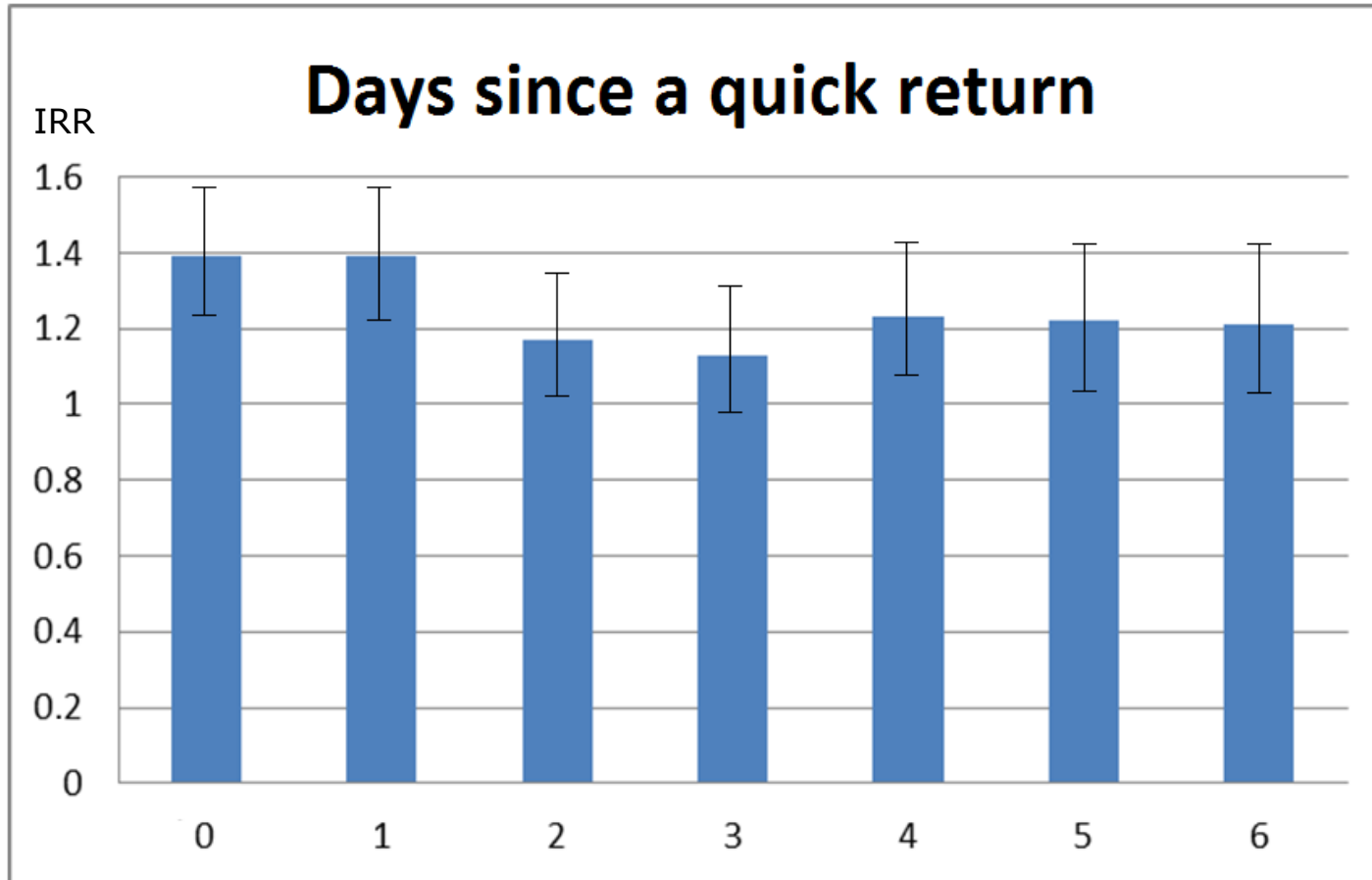
	Injury cases n= 5387	PY PY= 65 979	Model 2: QR periods		
			IRR	95%CI	P-value
Days since quick return					
Day 0: 15-17 hours (ref)	1766	20 431	1		
Day 0: quick return	259	2431	1.21	1.06-1.38	0.009
Day 1: 15-17 hours (ref)	1571	20 770	1		
Day 1: quick return	229	2302	1.29	1.12-1.48	0.001
Day 2: 15-17 hours (ref)	1532	20 939	1		
Day 2: quick return	177	2253	1.05	0.90-1.23	0.540
Day 3: 15-17 hours (ref)	1530	20 526	1		
Day 3: quick return	171	2180	1.03	0.88-1.21	0.733
Day 4: 15-17 hours (ref)	1601	20 039	1		
Day 4: quick return	181	2061	1.06	0.91-1.24	0.474
Day 5: 15-17 hours (ref)	1538	19 537	1		
Day 5: quick return	174	1935	1.11	0.95-1.30	0.219
Day 6: 15-17 hours (ref)	1427	18 490	1		
Day 6: quick return	158	1784	1.12	0.95-1.32	0.195

Results



Quick return (6-11 hours) on day or day before
Adjusted for calendar year, season, age, sex, occupation

Results



Adjusted for calendar year, season, age, sex, occupation

Study population

Employee characteristics at entrance	Ever quick return N = 36 875		Never quick return N = 32 325	
	%	N	%	N
Age, year				
18-24	5.6	2054	5.1	1645
25-34	32.8	12 103	27.8	8981
35-44	26.5	9779	25.4	8210
45-54	25.1	9271	24.6	7959
55-65	10.0	3668	17.1	5530
Sex				
Women	76.7	28 295	74.2	23 997
Occupation				
Administrative work	12.9	4762	34.6	11 183
Patient contact	75.5	27 825	48.7	15 741
Technical staff	3.5	1281	4.1	1318
Socioeconomic status				
High	23.1	8509	34.3	11 077
Intermediate	50.2	18 498	32.2	10 395
Low	26.8	9868	33.6	10 853

Study population

Employee characteristics	Cases N=11 834		At entrance N= 69 200		Person years PY=167 726	
	N	%	N	%	PY	
Age, year						
18-24	369	5.4	3699	1.4	2392	
25-34	2863	30.5	21 084	18.0	30 187	
35-44	3054	26.0	17 989	26.2	43 960	
45-54	3223	24.9	17 230	31.9	53 453	
55-65	2325	13.3	9198	22.5	37 734	
Sex						
Women	8655	75.6	52 292	72.7	121 918	
Occupation						
Administrative work	2244	23.0	15 945	25.1	42 075	
Patient contact	7603	63.0	43 566	61.1	10 2483	
Technical staff	1987	14.0	9689	13.8	23 168	
Socioeconomic status						
High	3042	28.3	19 586	32.6	54 703	
Intermediate	5362	41.8	28 893	44.7	75 036	
Low	3430	29.9	20 721	22.7	37 987	

Results

	Injury cases	Person years	IRR (95%CI)
Time between shifts			
Continuous 1-17 hours	5088	71 276	0.95 (0.93–0.96)
Quick return			
≤11 hours vs. 15-17 hours (ref)	259	2431	1.39 (1.23-1.58)
Number of quick returns past week			
Continuous 1-7	1359	15 010	0.97 (0.87–1.08)
Days since quick return			
Continuous 0-6	1359	15 010	0.97 0.94–1.00

Adjusted for calendar year, season, age, sex, occupation