

Appendix 1. Group Information

List of participating centers and collaborators of the JUMODA (JUmeaux Mode d'Accouchement) study group and the GROG (Groupe de Recherche en Obstétrique et Gynécologie): **Alsace**: Coordinator: Pr Langer: CHU Hautepierre (Dr Sananes), CMCO de Schiltigheim (Dr Favre), CMC de Colmar (Dr Kutnahorsky), CHR de Mulhouse (Mme Fessler), CHR d'Haguenau (Dr Lehmann), Clinique Sainte-Anne, Strasbourg (Dr Adam, Dr Plemere) — **Aquitaine**: Coordinator: Dr Chabanier: CHU de Bordeaux (Dr Chabanier), Clinique Bagatelle, Talence (Dr Trebesses), CH de Bayonne (Dr Poumier-Chabannier), CH de Mont de Marsan (Dr Defert), CH de Pau (Dr Bohec), Polyclinique de Navarre, Pau (Dr Collin) — **Auvergne**: Coordinator: Dr Venditelli: CHU de Clermont-Ferrand (Dr Venditelli), Clinique de la Chataigneraie, Beaumont (Dr Deffarges, Dr Vidal), CH de Vichy (Dr Desvignes), CH du Puy-en-Velay (Dr Samuel) — **Basse Normandie**: Coordinator: Pr Dreyfus, CHU de Caen (Dr Beucher, Dr Dolley), Clinique du Parc, Caen (Dr Durin), CH d'Avranches (Dr Six), CH de Lisieux (Dr Beniada), CH de Saint-Lô (Dr Balouet), CH de Cherbourg (Dr Després, Mme Mathis) — **Bourgogne**: Coordinator: Pr Sagot: CHU de Dijon (Dr Yacoub), CH de Chalon-sur-Saône (Dr Bulot), CH d'Auxerre (Dr Dellinger), CH de Mâcon (Dr Spagnolo) — **Bretagne**: Coordinator: Pr Poulain: CHU de Rennes (Pr Poulain), Clinique de la Sagesse, Rennes (Dr Moquet, Mme Bourgault), CHP Saint-Grégoire (Dr Seconda), CH de Saint-Brieuc (Dr Moinon), CH de Saint-Malo (Dr Roy-Dahhou), CH Bretagne Sud, Lorient (Dr Pittion), CH Bretagne Atlantique, Vannes (Dr Chauveau), CHU de Brest (Dr Laurent, Dr Lelièvre), CH de Quimper (Dr Bellot), Polyclinique de Keraudren, Brest (Dr Salnelle) — **Centre**: Coordinator: Pr Perrotin: CHRU de Tours (Pr Perrotin), CH d'Orléans (Dr Ramos), CH de Blois (Dr Montmasson), CH de Chartres (Dr Ollivier), CH de l'agglomération montargoise (Dr Hoock, Dr Ben Romdhane) — **Champagne Ardennes**: Coordinator: Pr Graesslin: CHU de Reims (Pr Graesslin), CH de Charleville Mézières (Dr Méreb) — **Franche-Comté**: Coordinator: Pr Riethmuller: CHU de Besançon (Pr Riethmuller), CH de Pauphilet V, Goffinet F, Seco A, Azria E, Cordier AG, Deruelle P, et al. Effects of internal version compared with pushing on neonatal morbidity of cephalic second twins. *Obstet Gynecol* 2020;135.

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Pontarlier (Dr Boyadjian), CH de Dole (Dr Gannard), CH de Belfort (Dr Levy), CH de Lons le Saunier (Dr Reviron) — **Haute Normandie**: Coordinator: Pr Marpeau: CHU de Rouen (Pr Verspyck), Clinique Mathilde, Rouen (Dr Durand Reville), CH Le Havre (Dr Talbot), CH d'Elbeuf (Dr Mathieu), CH d'Evreux (Dr Machevin), CH de Vernon (Dr Truong Canh), CH du Belvédère, Mont Saint-Aignan (Dr Guillon) — **Ile-de-France**: Coordinator: Pr Schmitz: CHU Robert Debré (Pr Schmitz), CHU Cochin-Port Royal (Dr Ménard), CHU Bichat (Dr Bourgeois Moine), CHU Pitié Salpêtrière (Pr Nizard, Pr Dommergues), CHU Trousseau (Dr De Carné Carnavalet), CHU Necker Enfants Malades (Dr Lemercier), CHU Tenon (Dr Bornes), CHU Lariboisière (Dr Ricbourg), Hôpital des Diaconesses (Dr Harvey), Institut Mutualiste Montsouris (Dr Azarian), Groupe Hospitalier Saint Joseph (Dr Azria), CHU Louis Mourier (Pr Kayem), CHU Antoine Béclère (Pr Benachi), CHU Beaujon (Dr Ceccaldi), CHU Bicêtre (Pr Sénat), CH de Neuilly (Dr Galimard), Hôpital Foch (Dr Picone), CH de Saint-Denis (Dr Bounan, Dr Hatem), CH de Montreuil (Pr Poncelet), CHU Jean Verdier (Pr Carbillon), CHI de Créteil (Pr Haddad), Hôpitaux de Saint Maurice Esquirol (Dr Pachy), CH de Pontoise (Mme Deshons), CH de Montmorency (Dr Colliaut Espagne), CHI de Poissy (Pr Rozenberg), CH de Versailles (Dr Raynal), CH de Mantes la Jolie (Dr Godard), CH de Villeneuve Saint-Georges (Dr Soltane, Dr Piel), CH de Longjumeau (Dr Abbara), CH du Sud Francilien, Corbeil Essonne (Dr Rigonnot), CH de Melun (Dr Jault), CH de Fontainebleau (Dr Marchaudon), CH de Meaux (Dr Moumen), CH de Lagny (Dr Wafo) — **Languedoc-Roussillon**: Coordinator: Pr De Tayrac: CHU de Nîmes (Pr De Tayrac), Polyclinique Grand Sud, Nîmes (Dr Léonard), Polyclinique Kennedy, Nîmes (Dr Terschiphorst), CHU de Montpellier (Dr Vintejoux), Clinique Clémentville, Montpellier (Dr Filippi), Clinique Saint-Roch, Montpellier (Dr Rouard), CH de Béziers (Dr Galtier), CH de Carcassonne (Dr Cogan), CH de Perpignan (Dr Koninck) — **Lorraine**: Coordinator: Pr Morel: CHU de Nancy (Pr Morel), CH de Metz (Dr Dahlhoff Rodriguez), CH de Thionville (Dr Collin) — **Midi Pyrénées**: Coordinator: Pr Parant: CHU de Toulouse (Pr Parant), Clinique Sarrus (Dr Thévenot, Dr Céré) — **Nord Pas-de-Calais**:

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Coordinator: Pr Deruelle: CHRU de Lille (Pr Deruelle, Dr Clouqueur), Polyclinique du Bois, Lille (Dr Pouilly), GHIC Saint-Vincent-de-Paul, Lille (Dr Denoit), CH d'Armentières (Dr Régis, Dr Rivaux), CH de Roubaix (Dr Legoueff), CH de Tourcoing (Dr Jambon), CH de Seclin (Dr Bory), CH de Valenciennes (Dr Sendon, Dr Tillouche), CH de Dunkerque (Dr Boodhun), CH de Lens (Dr Bothuyne), CH de Boulogne-sur-Mer (Dr Sicot), CH d'Arras (Dr Brochot), CH de Calais (Dr Carillon, Dr Coudoux), CH de Saint-Omer (Dr Notteau) — **PACA Ouest:**

Coordinator: Pr D'Ercole: CHU Marseille, Hôpital Nord (Dr Hautemonte), CHU Marseille, Hôpital La Conception (Dr Heckenroth), CH Saint-Joseph (Dr Desbrière), CH de Martigues (Dr Volle), CH de Toulon (Dr Mauviel), CH d'Aix-en-Provence (Dr Danoy), Clinique l'Etoile-Maternité catholique de Provence, Aix en Provence (Dr Marpeau), CH de Salon de Provence (Dr David), CH d'Avignon (Dr Lepreux) — **PACA Est:** Coordinator: Pr Bongain: CHU de Nice (Dr Leroux Hilmi, Dr Adrados), Clinique Saint-Georges, Nice (Mme Roulant), CH de Grasse (Dr Kaemmerlen), CH d'Antibes (Dr Duforestel), CH de Cannes (Dr De Jesus) — **Pays de Loire:** Coordinators: Pr Winer, Pr Sentilhes: CHU de Nantes (Pr Winer), Polyclinique de l'Atlantique, Nantes (Dr Paumier), Clinique Jules Verne, Nantes (Dr Lebret-Colau), CH de Saint-Nazaire (Dr Troche), CHU d'Angers (Pr Sentilhes), CH Le Mans (Dr Chèvre), CH de Saumur (Dr Moya), CH de Laval (Dr Karirisi), CH de Cholet (Dr Pasco), CH de La Roche-sur-Yon (Dr Ducarme) — **Picardie:** Coordinator: Pr Gondry: CHU d'Amiens (Dr Théret), Groupe Santé Victor Pauché, Amiens (Mme Buisson), CH de Beauvais (Dr Urbaniack), CH de Creil (Dr Dienga), CH de Saint-Quentin (Dr Closset), CH de Compiègne (Dr Touzart) — **Poitou-Charentes Limousin:** Coordinator: Pr Pierre: CHU de Poitiers (Pr Pierre), CH de La Rochelle (Dr Leborgne), CH de Rochefort (Dr Lathélize), CH de Niort (Dr Chauvet), CH d'Angoulême (Dr Sarreau), CH de Saintes (Dr Bretheau), CH de Châtellerault (Dr Godard), CH Nord Deux Sèvres, Bressuire (Dr Yannoulopoulos), CHU de Limoges (Pr Aubard) —

Rhône Alpes: Coordinators: Pr Rudigoz, Mme Dupont: CHU La Croix Rousse, Lyon (Pr Rudigoz), CHU Lyon Sud, Lyon (Pr Dupuis), CHU Mère-Enfant, Lyon (Dr Battie), Hôpital

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Natecia, Lyon (Dr Mein), Clinique du Val d'Ouest, Ecully (Dr Mossan-Lourcy), Clinique Saint-Vincent-de-Paul, Bourgoin-Jallieu (Dr Rane), CH de Valence (Dr Fernandez), CH de Villefranche (Dr Sayegh), CH de Montélimar (Dr Dirix), CH de Roanne (Dr Nord), CHU de Saint-Etienne (Pr Chauleur), CH de Bourg-en-Bresse (Dr Hugot, Dr Ferlay), CHU de Grenoble (Dr Equy), Clinique Belledonne, Grenoble (Dr Canonica), CH de Voiron (Dr Gaillard), CH de Chambéry (Dr Dubois), CH de Sallanches (Dr Dujardin), CH d'Annecy (Dr Braig), CH d'Annemasse (Dr Deramecourt), CH de Thonon (Dr Vincent-Génod).

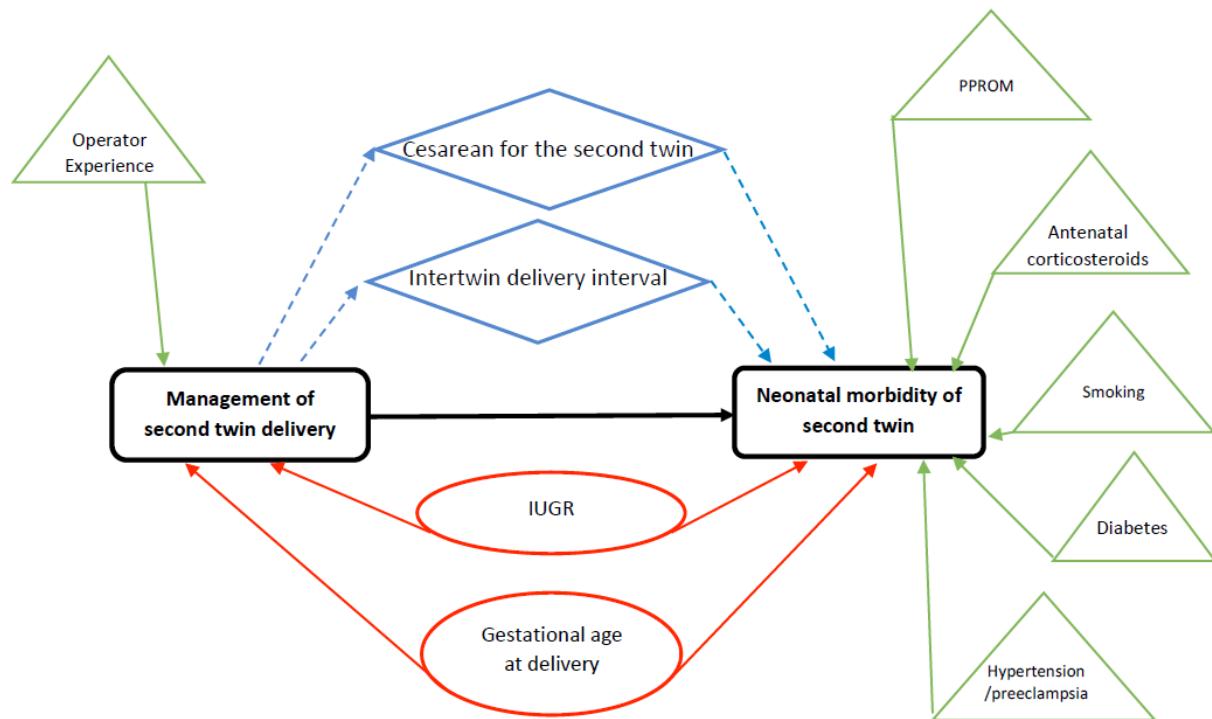
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Appendix 2. Directed acyclic graph.



- Confounding factors integrated in the final model
- △ Adjustment factors frequently used in the literature
- ◇ Potential intermediate factor
- IUGR: IntraUterin Growth Restriction
- PPROM: Preterm Premature Rupture Of Membranes

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Appendix 3. Association Between Neonatal Outcomes and Management of Cephalic Second-Twin Delivery at or After 37 Weeks of Gestation

	Internal Version	Pushing	<i>P</i> value
	N= 272	N= 928	
Intertwin delivery interval (min, median, Q1-Q3)	5 [3-8]	8 [5-12]	.0001
Cesarean for the second twin	2 (0.7)	29 (3.1)	.03
		RR [95%CI]	aRR [95%CI]*
Primary outcome - Composite morbidity	3 (1.1)	12 (1.3)	0.85 [0.24-3.00] 0.86 [0.25-2.93]
Death			
Intrapartum	0	0	
Neonatal	0	0	
Apgar score <4 at 5 min	0	4 (0.4)	
Trauma	2 (2.0)	0	
Long bone fracture	1 (1.0)	0	
Brachial plexus palsy	1 (1.0)	0	
Skull fracture	0	0	
Spinal cord injury	0	0	
Phrenic or facial nerve injury	0	0	
Subdural hemorrhage	0	0	
Encephalopathy	0	2 (0.2)	
≥ 2 seizures within 72 h after birth	0	1 (0.1)	
Endotracheal tube for >24 h within 72 h after birth	1 (1.0)	2 (0.2)	
Proven neonatal sepsis	0	6 (0.6)	
Bronchopulmonary dysplasia	0	0	
Grade III-IV intraventricular hemorrhage	0	0	
Periventricular leukomalacia	0	0	
Stage 2 and 3 necrotizing enterocolitis	0	0	

aRR denotes adjusted Relative Risk and CI confidence interval

*Adjustment for fetal growth restriction

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Appendix 4. Association Between Neonatal Outcomes and Management of Cephalic Second-Twin Delivery Before 37 Weeks of Gestation

	Internal Version	Pushing	<i>P</i> value
	N= 215	N= 841	
Intertwin delivery interval (min, median, Q1-Q3)	5 [4-8]	8 [5-12]	.0001
Cesarean for the second twin	3 (1.4)	37 (4.4)	.04
			RR [95%CI]
			aRR [95%CI]*
Primary outcome - Composite morbidity	14 (6.5)	26 (3.1)	2.11 [1.12-3.96] 2.18 [1.15-4.13]
Death	0	1 (0.1)	
Intrapartum	0	0	
Neonatal	0	1 (0.1)	
Apgar score <4 at 5 min	1 (0.5)	2 (0.2)	
Trauma	1 (0.5)	1 (0.1)	
Long bone fracture	1 (0.5)	1 (0.1)	
Brachial plexus palsy	0	0	
Skull fracture	0	0	
Spinal cord injury	0	0	
Phrenic or facial nerve injury	0	0	
Subdural hemorrhage	0	0	
Encephalopathy	1 (0.5)	2 (0.2)	
≥ 2 seizures within 72 h after birth	0	1 (0.1)	
Endotracheal tube for >24 h within 72 h after birth	6 (2.8)	9 (1.0)	
Proven neonatal sepsis	5 (2.3)	10 (1.2)	
Bronchopulmonary dysplasia	1 (0.5)	4 (0.6)	
Grade III-IV intraventricular hemorrhage	1 (0.5)	0	
Periventricular leukomalacia	0	1 (0.1)	
Stage 2 and 3 necrotizing enterocolitis	0	0	

aRR denotes adjusted Relative Risk and CI confidence interval

*Adjustment for gestational age at birth and fetal growth restriction

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Appendix 5. Association Between Neonatal Outcomes and Center Expertise in Management of Cephalic Second-Twin at or After 37 Weeks of Gestation

	Expert in Internal Version	Expert in Pushing	<i>P</i> value
	N= 194	N= 281	
Intertwin delivery interval (min, median, Q1-Q3)	6 [3.0-7.0]	11 [5.0-12.0]	.0001
Cesarean for the second twin	4 (2.1)	5 (1.8)	0.80
			RR [95%CI]
Primary outcome - Composite morbidity	2 (1.0)	1(0.4)	2.90 [0.26-31.81]
Death			NA
Intrapartum	0	0	
Neonatal	0	0	
Apgar score <4 at 5 min	0	0	
Trauma	1 (0.5)	0	
Long bone fracture	1 (0.5)	0	
Brachial plexus palsy	0	0	
Skull fracture	0	0	
Spinal cord injury	0	0	
Phrenic or facial nerve injury	0	0	
Subdural hemorrhage	0	0	
Encephalopathy	0	0	
≥ 2 seizures within 72 h after birth	0	0	
Endotracheal tube for >24 h within 72 h after birth	1 (0.5)	0	
Proven neonatal sepsis	0	1 (0.4)	
Bronchopulmonary dysplasia	0	0	
Grade III-IV intraventricular hemorrhage	0	0	
Periventricular leukomalacia	0	0	
Stage 2 and 3 necrotizing enterocolitis	0	0	

aRR denotes adjusted Relative Risk and CI confidence interval

*Adjustment was not possible in this subgroup because of the too small number of events.

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Appendix 6. Association Between Neonatal Outcomes and Center Expertise in Management of Cephalic Second-Twin Before 37 Weeks of Gestation

	Expert in Internal Version	Expert in Pushing	<i>P</i> value
	N= 180	N= 255	
Intertwin delivery interval (min, median, Q1-Q3)	7 [4.0-9.0]	10 [5.0-13.0]	.0001
Cesarean for the second twin	3 (1.7)	8 (3.1)	0.30
			RR [95%CI]
Primary outcome - Composite morbidity	11 (6.1)	9 (3.5)	1.73 [0.73-4.10]
Death			aRR [95%CI]*
Intrapartum	0	0	
Neonatal	0	1 (0.4)	
Apgar score <4 at 5 min	0	1 (0.4)	
Trauma	1 (0.6)	1 (0.4)	
Long bone fracture	1 (0.6)	1 (0.4)	
Brachial plexus palsy	0	0	
Skull fracture	0	0	
Spinal cord injury	0	0	
Phrenic or facial nerve injury	0	0	
Subdural hemorrhage	0	0	
Encephalopathy	0	0	
≥ 2 seizures within 72 h after birth	0	0	
Endotracheal tube for >24 h within 72 h after birth	6 (3.4)	4 (1.6)	
Proven neonatal sepsis	3 (1.7)	1 (0.4)	
Bronchopulmonary dysplasia	2 (1.1)	2 (0.8)	
Grade III-IV intraventricular hemorrhage	1 (0.6)	0	
Periventricular leukomalacia	0	1 (0.4)	
Stage 2 and 3 necrotizing enterocolitis	0	0	

aRR denotes adjusted Relative Risk and CI confidence interval

*Adjustment for gestational age at birth and fetal growth restriction

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